CARLSBAD (CBD)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Carlsbad (CBD)
Audit Dates:	July 25 - 27, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Cat Russell
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

Noise from a recycling facility made data capture by the audit sodar impossible during the hours from 13:00 pdt to 16:00 pdt on 7/25/97. Once the recycling facility closed at 16:00 pdt, it was possible to resume the collection of sodar data. Since the recycling facility was scheduled to resume operations at 07:30 pdt on 7/26/97, it was decided to move the sodar to another location approximately 300 meters north of the original location.

SITE CHARACTERISTICS

The site is located on a bluff behind the Carlsbad fire station # 5. The bluff faces east and south. Trees line the extension of the bluff on the northeast side. Buildings of a light-industry industrial park are visible on the bluff across the adjacent canyon at approximately ¼ to ½ mile. Palomar Airport Road is approximately ¼ to ½ mile to the south of the site. The approach to Palomar Airport parallels Palomar Airport Road.

SYSTEM AUDIT NOTES

1. The orientation of the RWP oblique antennas were measured at 95° for the east antenna and 184° for the south antenna by the audit. The RWP controller settings for the oblique antenna pointing angles was 95° and 187°. Following the audit the pointing direction of the south antenna was changed to 185°, the angle measured by the NOAA/ETL site operator during the audit.

2. The south RWP antenna zenith angle was measured to be 15.1° and the east antenna zenith angle was measured as 14.8°. The RWP set up puts these zenith angles at 15°. A calculation of the wind speed and wind direction error attributed to these discrepancies are approximately 0.4% and 1.2%, respectively. The controller should be reset to compensate for these differences so that the winds are calculated correctly.
3. The levels of the south RASS acoustic source dish exceeded the EPA PAMS recommended criteria of ± 1.0°. The dish was leveled following the audit. No further action is required.
4. The NOAA/ETL RASS acoustic sources consist of a parabolic dish and a "floating" acoustic driver that is not connected to the dish. There is a question about how the position of the driver with respect to the focus of the parabolic dish may effect the altitude that the RASS acoustic source signals can reach and the vertical range of the RASS measurements.
5. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
6. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.
7. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

POTENTIAL ACTIVE NOISE SOURCES

No RFI was detected from a scan of the frequencies between 914 and 916 mHz and a listen only check.

POTENTIAL PASSIVE NOISE SOURCES

No passive sources were noted. The east antenna data did not indicate clutter from the trees that line the bluff to the immediate northeast of the site.

ANTENNA LEVEL AND ALIGNMENT

The level of the west RASS acoustic source driver was outside of the audit criteria of ±1.0°.

RADAR PROFILER PERFORMANCE AUDIT

The results of the comparisons between the 7/25/97 15:00 pdt rawinsonde winds and radar profiler winds and the 7/26/97 10:00 pdt rawinsonde winds and the radar profiler winds are as follows:

Wind Speed

Soundings	Low Mode			High Mode		
	Comparable Data Points	Average Diff.	Std. Dev.	Comparable Data Points	Average Diff.	Std. Dev.
7/25 1500 pdt	33	-0.2	1.4	28	-0.6	1.3
7/26 1000 pdt	7	-1.1	2.6	8	-0.3	1.8

Wind Direction

Sounding	Low Mode			High Mode		
	Comparable Data Points	Average Diff.	Std. Dev.	Comparable Data Points	Average Diff.	Std. Dev.
7/25 1500 pdt	33	12	23	28	8	16
7/26 1000 pdt	7	22	67	8	18	28

Where there is sufficient data to compare, the two measurement systems tend to compare very well.

RASS PERFORMANCE AUDIT

The RASS data was compared with virtual temperature data calculated from the temperature, humidity and pressure data collect by on-site rawinsonde soundings. Preliminary results showed good agreement between the two measurement systems at altitudes above 800 meters in the morning, and 500 meters in the afternoon. The morning sounding showed the RASS data to underestimate the instability under the inversion and the height of the bottom of the mixed layer, as compared with the rawinsonde data. In the afternoon sounding, the two virtual temperature profiles are almost identical, but with the difference that the RASS virtual temperature values were, on the average, 1°C less than the corresponding rawinsonde values.

RADAR PROFILER DATA INTERNALCONSISTENCY

1. Overall, the data look reasonable and consistent between the two modes of operation. A review of the data collected during the three days prior to the audit showed the data collected in the low mode to have a maximum altitude of around 1,000 to 1,200 meters during the morning and evening hours, while the high mode winds extended well into the 2,000 meter range. During the afternoon the data in both modes extended close to the maximum height settings. The limited altitudes during the evening and morning hours appeared to be caused by a layer of clutter that may have been associated with a dry layer aloft. Support for this can be seen in the morning rawinsonde soundings where a relatively strong elevated inversion was present between 700 and 900 meters. An inversion was also present in the mid-afternoon sounding, but it was weaker than the inversion present in the morning sounding.

RASS DATA INTERNAL CONSISTENCY

1. The RASS data, like the RWP wind data, are limited to between 1,000 and 1,200 meters, on the average, in the morning and evening hours increasing to at times the maximum height setting altitudes during the afternoon hours.
2. It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. This will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SURFACE METEOROLOGY PERFORMANCE AUDIT

1. All sensors are scanned every 10 seconds with five minute averages recorded. However, not all of the variables could be audited completely. A summary of these audits are provided below:
   - Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the tower to perform the torque test. Future installations should consider an alternate installation that will allow for appropriate sensor evaluation.
2. Wind data recorded include scalar wind speed and resultant vector wind direction.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Carlsbad (CBD)
AUDITOR:	Alexander N. Barnett
DATE:	July 25 - 27, 1997
KEY PERSON:	Cat Russell

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	NOAA/ETL	915 MHz	915-32-7	Lo 138 - 2282 m at 58 m inc. Hi 138 - 3890 m at 101 m inc.
Virtual Temperature	RASS	NOAA/ETL	915 MHz	915-32-7	157 - 1628 m at 105 m inc. (see below)
	Audio amplifier	Crest Audio	NA	NA	NA
10 m Wind Speed	Propeller	RM Young	05103	23305	0 - 50 m/s
10 m Wind Direction	Vane	RM Young	05103	23305	0 - 355 degrees
2 m ambient temperature	RTD	Campbell	CS-500	NA	-35 - 50 °C
2 m relative humidity	Solid State	Campbell	CS-500	NA	0 - 100%
Data Logging	Digital	Campbell	21X	NA	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station is also monitoring total solar and net radiation and barometric pressure. As indicated above the RASS resolution should be increased to about 60 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	SMT	NA	NA	NA
RWP computer	Diversified Technology	NA	NA	NA
RASS amplifier	Crown	460-CSL	NA	NA
Power conditioner	Best	MD1-4kva	NA	NA
Optical Disk	NA	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
NA[1]	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments:

1. Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (three axis radar antenna)	Radar – 1°, 3° 10 m Vane – 4°	No Yes
2. Level (level and inclination of the horiz ant)	Radar – 14.8° RASS – 1.9°	No No
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments:

1. The the orientation of the east RWP antenna differs from the audit determined orientation by 1°. The orientation of the south antenna differs from the audit determined orientation by 3°.
2. The south RASS acoustic source dish was out of level by 1.9°. The dish was leveled following the audit.
4. A listen only test of the radar revealed no significant RF sources nearby.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	None	Yes
3. Is separation at least 10x obst. height?	No	No
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	3 m	Yes
8. Distance of temp sensor from obst.	None	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	None	Yes
11. Are the distances 4x the obst. height?	Yes	see below
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments:

1,2,3. Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes (see below)	Yes
5. Are serial numbers available?	Yes	Yes
6. Do data system times agree with audit times. If not, what is the deviation?	Yes ~ 30 sec.	Yes
7. Is the printer functional?	NA	NA
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments:

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4.1	Yes
2. High mode pulse length	700 ns	Yes
3. Low mode pulse length	400 ns	Yes
4. RASS pulse length	700 ns	Yes
5. RASS acoustic temperature Range?	10 - 40°C	Yes
6. RASS acoustic source range?	10 - 40°C	Yes
7. Time zone	GMT	Yes
8. Wind data consensus	53 min (see below)	Yes
9. RASS consensus	7 min (see below)	Yes

Comments:

8, 9. The configuration was changed to gave a 53 minute wind data consensus and a 7 minute RASS consensus. This was done in response to findings at other NOAA sites where it was

found that the polling of the surface data during the first five minutes of the hour only gave about a 3.5 minute RASS consensus.

	Wind Low Mode	Wind High Mode	RASS
First Gate	138 m	138 m	157 m
Last Gate	2282 m	3890 m	1628 m
Spacing	58 m	101 m	105 m
Full Scale Velocity	10.2 m/s	10.2 m/s	409.6 m/s

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes (see below)	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 2. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

7. Security is good. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to NOAA/ETL on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to an optical drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

5. It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Carlsbad	Instrument:	NOAA/ETL
Date:	7/25/97 - 7/27/97	Receiver s/n:	915-32-7
Time:		Interface s/n:	915-32-7
Measurements group:	NOAA/ETL	Frimware version:	POP-4.1
Key contact:	Cat Russell	System rotation angle:	95°, 185°
Audited by:	Alex Barnett	Measured orientation:	94°, 184°
Site longitude:	117° 15.91'W	Orientation difference:	1°, 1°
Site latitude:	33° 08.22'N	Vertical antenna level:	N-S: 0.2° E-W: 0.3°
Site elevation:		Beam zenith angle:	15.1°, 14.8°
Magnetic declination:	14°E	Beam directions:	

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	West edge of aircraft parking apron. Hangers in the distance.
NA	30	<2	Aircraft parking apron. Aircraft hangers in the distance.
NA	60	<2	Aircraft parking apron.
NA	90	<2	South edge of aircraft parking apron.
NA	120	<2	Open area south of aircraft parking apron. ¼ mile to busy street.
NA	150	<2	Strawberry field. 4' chain link fence 30m away. ¼ mile to busy street.
NA	180	<2	Strawberry field. 4' chain link fence 30m away. ¼ mile to busy street.
NA	210	5	Strawberry field. 150m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	240	5	120m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	270	5	100m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	300	10	Building 15' high 10m from site.
NA	330	10	Building 15' high 10m from site.

Comments:

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Carlsbad	Instrument:	NOAA/ETL
Date:	7/25/97 - 7/27/97	Receiver s/n:	915-32-7
Time:		Interface s/n:	915-32-7
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Key contact:	Cat Russell	System rotation angle:	95°, 185°
Audited by:	Alex Barnett	Measured orientation:	94°, 184°
Site longitude:	117° 15.91'W	Orientation difference:	1°, 1°
Site latitude:	33° 08.22'N	Vertical antenna level:	N-S: 0.2° E-W: 0.3°
Site elevation:		Beam zenith angle:	15.1°, 14.8°
Magnetic declination:	14°E	Beam directions:	

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	West edge of aircraft parking apron. Hangers in the distance.
NA	30	<2	Aircraft parking apron. Aircraft hangers in the distance.
NA	60	<2	Aircraft parking apron.
NA	90	<2	South edge of aircraft parking apron.
NA	120	<2	Open area south of aircraft parking apron. ¼ mile to busy street.
NA	150	<2	Strawberry field. 4' chain link fence 30m away. ¼ mile to busy street.
NA	180	<2	Strawberry field. 4' chain link fence 30m away. ¼ mile to busy street.
NA	210	5	Strawberry field. 150m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	240	5	120m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	270	5	100m to base boundary that runs along Red Hill Road. 20' tall trees line Red Hill Road. Single story industrial park on West side of Red Hill Road.
NA	300	10	Building 15' high 10m from site.
NA	330	10	Building 15' high 10m from site.

Comments:

AeroVironment Environmental Services Inc.
HORIZONTAL WIND SPEED

Date: 07/25/97
Start: 17:30 PDT
Finish: 17:50 PDT
Audited By: Alex Barnett
Witness: Cat Russell

Site Name: Carlsbad
Operator: NOAA-ETL
Project: NOAA-ETL

Manufacturer: R.M.Young
Serial No.: 23305
K factor: 1.4
Range: 50 m/s

Model: 05103
Sensor Ht.: 10 meters
Starting torque: 0.2 gm cm
Starting threshold: 0.38 m/s

Last calibration date:

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Audit Point	m/s Input	m/s Chart	m/s Diff. Chart	m/s DAS	m/s Diff. DAS
1	0.00	#N/A	#N/A	0.00	0.00
2	2.50	#N/A	#N/A	4.50	2.00

Audit Criteria: +/-.25 m/s; ws <= 5 m/s

Audit Point	m/s Input	m/s Chart	% Diff. Chart	m/s DAS	% Diff. DAS
3	14.70	#N/A	#N/A	8.70	-40.8
4	34.30	#N/A	#N/A	16.90	-50.7

Audit Criteria: +/- 5%; ws > 5 m/s

Comments: None

AeroVironment Environmental Services Inc.
HORIZONTAL WIND DIRECTION

Date: 07/25/97
Start: 17:30 PDT
Finish: 17:50 PDT
Audited By: Alex Barnett
Witness: Cat Russell

Site Name: Carlsbad
Operator: NOAA-ETL
Project: NOAA-ETL

Manufacturer: R.M.Young
Serial No.: 2305
K factor: 29.8
Range: 355 Deg
Crossarm: 0 Deg true

Model: 05103
Sensor Ht.: 10 meters
Starting torque: 5 gm cm
Starting threshold: 0.41 m/s

Last calibration date:

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.0	0.0

WD Audit Point	Degrees Reference	Degrees Chart	Diff. Chart	Degrees DAS	Diff. DAS
1	36	#N/A	#N/A	32	-4
2	121	#N/A	#N/A	120	-1
3	170	#N/A	#N/A	168	-2
4	256	#N/A	#N/A	258	2

Audit Criteria: +/- 5 degrees

Comments: None

AeroVironment Environmental Services Inc.
AMBIENT TEMPERATURE

Date: 07/25/97
Start: 18:00 PDT
Finish: 18:12 PDT
Audited By: Alex Barnett
Witness: Cat Russell

Site Name: Carlsbad
Operator: NOAA-ETL
Project: NOAA-ETL

Manufacturer: Campbell
Serial No.: NA
Lower Range: -50 Deg C
Upper Range: 50 Deg C

Model: CS-500
Sensor Ht.: 1.5 Meters

Last calibration date:

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	22.3	#N/A	#N/A	22.5	0.2

Audit Criteria: +/- 1.0 degree Celsius

Comments: None

AeroVironment Environmental Services Inc.
RELATIVE HUMIDITY

Date: 07/25/97
Start: 17:26 PDT
Finish: 17:30 PDT
Audited By: Alex Barnett
Witness: Cat Russell

Site Name: Carlsbad
Operator: NOAA-ETL
Project: NOAA-ETL

Manufacturer: Campbell
Serial No.: NA

Model: CS-500
Sensor Ht.: 1.5 Meters

Psychro. Units: Deg C

Last calibration date:

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.00	0.00

R.H. Audit Point	R.H. Input	R.H. Chart	R.H. Diff. Chart	R.H. DAS	R.H. Diff. DAS
1	67.5	30.0	-37.5	76.8	9.3

Audit Criteria: N/A

Equivalent Dew Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	15.2	3.1	-12.1	15.9	0.7

Audit Criteria: +/- 1.5 degrees Celsius

Comments: None

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Carlsbad
Date: July 26 - 27, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Inc. Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.8
Maximum:	2.1
Minimum:	-7.4
Standard Deviation:	1.7
Root Mean Square (RMS):	2.5

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)					
Date	Hour	138	239	340	441	542	643
	8:15:00		-1.1	-3.1	-5.0	-5.2	-7.4
	9:15:00	-1.8	-1.6			-1.6	-1.8
	10:15:00			-3.3			
	11:15:00		-0.8	-1.5	-4.2	-5.3	
	12:15:00	-0.6	-1.0	-1.1	-3.4	-4.4	
	13:15:00		-2.7	-3.7		-5.1	-1.7
	14:15:00		-0.3	-2.4	-5.1	-3.4	-2.0
	15:15:00		-0.2	0.7	-0.2		
	16:15:00		-1.9	-2.3	-3.2	-3.4	
	17:15:00			-1.5	-1.3		-0.7
	18:15:00			-1.7	-2.0		0.9
	19:15:00				-0.2		-0.3
	20:15:00			0.1	-0.5		-1.6
	21:15:00			-1.4	-0.9		
	22:15:00			-0.3	-1.2		
	23:15:00					-0.7	-0.8
07/27/98	0:15:00						-1.8
	1:15:00			0.3	-2.2	-1.4	
	2:15:00				-0.4		-0.2
	3:15:00				-1.4	-1.7	0.5
	4:15:00				-2.9	-2.8	
	5:15:00						-1.1
	6:15:00				-1.3		
	7:15:00		-2.0				-3.6
	8:15:00	-1.2	-0.3		-0.5	-2.9	-2.7
	9:15:00		-1.0				-1.4
	10:15:00	-1.6	-1.2	-2.0	-2.5	-2.2	-2.4
	11:15:00	2.1		0.3	0.4	-1.5	-6.3
	Average:	-0.6	-1.2	-1.4	-1.9	-3.0	-1.9
	Std Dev:	1.6	0.8	1.4	1.6	1.6	2.1
	RMS:	1.6	1.4	1.9	2.5	3.3	2.8
	Maximum:	2.1	-0.2	0.7	0.4	-0.7	0.9
	Minimum:	-1.8	-2.7	-3.7	-5.1	-5.3	-7.4

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Carlsbad
Date: July 26 - 27, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Inc. Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	-7
Maximum:	119
Minimum:	-172
Standard Deviation:	65
Root Mean Square (RMS):	65

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)					
Date	Hour	138	239	340	441	542	643
	8:15		-10.1	-66.5	-19.0	77.4	-13.2
	9:15	-2.1	-167.8			-132.5	-70.1
	10:15			-12.3			
	11:15		-40.0	-69.0	-77.0	18.9	
	12:15	-171.9	51.9	50.2	-24.3	-68.4	
	13:15		-47.8	-44.6		-53.5	-123.5
	14:15		20.4	-1.8	-15.6	-20.4	-14.7
	15:15		80.0	45.7	30.5		
	16:15		-10.9	-8.1	45.1	44.2	
	17:15			17.7	-16.5		5.0
	18:15			14.4	23.8		8.2
	19:15				-16.7		46.3
	20:15			47.5	27.4		-9.8
	21:15			54.6	17.2		
	22:15			28.2	4.6		
	23:15					-120.3	-69.4
07/27/98	0:15						3.2
	1:15			70.5	98.6	-3.7	
	2:15				75.4		-30.3
	3:15				111.6	72.5	-35.2
	4:15				97.7	22.9	
	5:15						8.1
	6:15				82.1		
	7:15		22.8				-23.4
	8:15	-136.1	-148.5		1.9	19.3	5.8
	9:15		-107.5				118.7
	10:15	87.3	-39.3	-50.4	10.4	-83.7	54.0
	11:15	-151.0		35.0	7.9	-18.5	23.1
	Average:	-75	-33	7	23	-18	-7
	Std Dev:	112	76	45	49	66	53
	RMS:	125	80	44	53	66	52
	Maximum:	87	80	71	112	77	119
	Minimum:	-172	-168	-69	-77	-132	-124

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Carlsbad
Date: July 26 - 27, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	1
Maximum:	162
Minimum:	-178
Standard Deviation:	67
Root Mean Square (RMS):	67

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)									
Date	Hour	138	196	254	312	370	428	486	544	602	660
	8:15			-165.6	-45.8	-62.8	-4.2	-3.1	-136.8	82.2	30.0
	9:15		-101.3					100.9	69.4	-149.6	-5.1
	10:15			-75.8	-74.1	-90.2					
	11:15			2.0	-5.4	-0.9		-55.8	-117.4		
	12:15	-177.8		85.7	43.6	46.1	38.3	36.8	28.8		
	13:15	108.1	67.6	74.9	63.5	61.5		19.0		9.1	57.1
	14:15		15.6	-23.1	-22.8		-14.0	-19.8	-34.7		-95.4
	15:15	51.5	75.6	36.0	48.5	34.7	10.2	-3.9			
	16:15		99.3	62.3	59.6	-15.6	-13.9	23.7	3.9		-114.1
	17:15				23.8	-4.0	52.4	28.5		-84.8	-28.8
	18:15			43.8	22.1	7.9	22.4	6.6		-42.3	-14.9
	19:15						-4.5			91.3	
	20:15					8.2	10.8	-11.1		-13.0	-35.2
	21:15				67.5	69.1	44.9	16.9			
	22:15					47.6	43.7	20.2			
	23:15					66.4	-9.5				
7/27/97	0:15					23.4	30.6				-78.2
	1:15					72.9	2.1	43.4			-22.4
	2:15						-61.6	-45.1			48.7
	3:15						111.3	91.6			
	4:15					-76.8	-24.2	-40.3	-11.6		
	5:15			10.1	35.1					-137.4	-11.4
	6:15						54.5			3.1	
	7:15		5.4	11.2	61.7	36.1				-0.3	-0.1
	8:15		-165.6				-4.0	68.0	77.2	51.3	57.5
	9:15		-174.2	-146.5					161.6	37.0	
	10:15	-170.2	-153.0	-127.3		-2.4	-16.2	14.5	-60.4	12.8	
	11:15	136.0			33.4	9.4	-3.4	30.3	30.2	17.9	
	Average:	-10	-37	-16	22	12	13	16	1	-9	-15
	Std Dev:	152	112	86	44	48	37	41	87	73	54
	RMS:	137	111	84	48	48	38	43	83	71	54
	Maximum:	136	99	86	67	73	111	101	162	91	57
	Minimum:	-178	-174	-166	-74	-90	-62	-56	-137	-150	-114

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: Carlsbad
Date: July 26 - 27, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.5
Maximum:	2.0
Minimum:	-7.7
Standard Deviation:	1.6
Root Mean Square (RMS):	2.2

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)									
Date	Hour	138	196	254	312	370	428	486	544	602	660
7/26/97	8:15			-2.1	-2.0	-3.4	-4.1	-5.2	-6.6	-7.7	-6.0
	9:15		-1.7					-2.3	-3.5	-0.5	-1.6
	10:15			-0.5	-1.2	-3.0					
	11:15			-1.9	-1.2	-0.7		-4.0	-5.2		
	12:15	-1.2		-1.3	-2.0	-1.3	-2.3	-3.4	-1.7		
	13:15	-0.5	-1.8	-3.6	-1.9	-2.9		-5.0		-2.5	-1.2
	14:15		-0.3	-1.8	-2.4		-3.9	-4.1	-3.4		-2.0
	15:15	-0.6	0.1	-1.2	0.7	1.3	-0.5	-0.2			
	16:15		-0.6	-1.7	-2.5	-3.2	-3.1	-2.6	-2.6		-1.7
	17:15				-0.2	0.3	-0.7	-0.8		-0.9	-1.2
	18:15			2.0	-1.6	-1.6	-0.4	0.4		-1.6	0.1
	19:15						-0.9			-2.3	
	20:15					0.0	-0.3	-0.1		-2.8	-0.7
	21:15				0.7	-2.4	-0.7	0.1			
	22:15					-1.3	-0.7	-0.5			
	23:15					0.6	-0.3				
7/27/97	0:15					-0.6	-0.3				-0.6
	1:15					-0.9	-1.7	-0.3			-1.2
	2:15						1.9	0.6			-3.0
	3:15						-0.2	-0.8			
	4:15					0.0	-2.4	-2.7	-2.4		
	5:15			-1.0	-0.9					-0.9	-3.6
	6:15						1.3			-1.3	
	7:15		-1.3	-1.1	-1.0	-1.4				-4.3	-3.6
	8:15		-1.9				-0.6	0.2	-2.2	-0.6	-2.6
	9:15		-1.4	-1.8					-0.2	-2.3	
	10:15	-0.1	1.0	-0.6		0.4	-0.7	-1.9	-2.3	-1.8	
	11:15	0.1			0.5	-0.4	-1.8	-1.3	-3.9	-3.8	
	Average:	-0.5	-0.9	-1.3	-1.1	-1.1	-1.1	-1.7	-3.1	-2.4	-2.1
	Std Dev:	0.5	1.0	1.3	1.1	1.4	1.5	1.9	1.7	1.9	1.6
	RMS:	0.6	1.3	1.8	1.5	1.7	1.8	2.5	3.5	3.0	2.6
	Maximum:	0.1	1.0	2.0	0.7	1.3	1.9	0.6	-0.2	-0.5	0.1
	Minimum:	-1.2	-1.9	-3.6	-2.5	-3.4	-4.1	-5.2	-6.6	-7.7	-6.0

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Carlsbad
Date: July 25-26, 1997
Measurements Group: NOAA
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	1.7
Maximum:	21.0
Minimum:	-5.1
Standard Deviation:	6.2
Root Mean Square:	6.4

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	7
Maximum:	46
Minimum:	-65
Standard Deviation:	22
Root Mean Square:	22

WS Difference (m/s)		
Altitude	7/25/97 1500	7/26/97 1000
138		
239		
340		
441		
542		
643	0.9	
744	-1.2	-5.1
845	-1.8	-4.0
946	-1.5	-0.4
1047	-1.7	1.9
1148	-3.0	2.8
1249	-1.6	
1350	0.6	0.6
1451	1.3	2.3
1552	1.3	1.7
1653	0.0	-0.3
1754	-1.8	3.9
1855	-1.5	8.6
1956	-0.6	13.3
2057	-0.7	19.0
2158	-1.3	19.2
2259	-1.9	21.0
2360	-0.6	
2461	0.4	
2562	-0.1	
2663	-0.9	
2764	-1.3	
2865	-3.8	
2966	-5.8	
3067	-3.8	
3168	-4.9	
3269	-13.1	
3370	-5.1	
3471	-4.2	
3572	-6.8	
Average:	-2.2	5.6
Maximum:	1.3	21.0
Minimum:	-13.1	-5.1
Std Dev:	2.9	8.5
RMS:	3.6	10.0

WD Difference (deg)		
Altitude	7/25/97 1500	7/26/97 1000
138		
239		
340		
441		
542		
643	45	
744	49	-130
845	28	-5
946	9	34
1047	17	22
1148	25	5
1249	14	
1350	10	-65
1451	16	-47
1552	7	-49
1653	4	35
1754	4	27
1855	6	24
1956	4	30
2057	2	24
2158	-1	12
2259	2	8
2360	9	
2461	6	
2562	-4	
2663	6	
2764	17	
2865	19	
2966	2	
3067	0	
3168	-24	
3269	-1	
3370	-6	
3471	22	
3572	46	
Average:	11	-5
Maximum:	49	35
Minimum:	-24	-130
Std Dev:	16	47
RMS:	19	46

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Carlsbad
Date: July 25-26, 1997
Measurements Group: NOAA
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	0.8
Maximum:	9.6
Minimum:	-6.6
Standard Deviation:	3.3
Root Mean Square:	3.4

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	17
Maximum:	117
Minimum:	-72
Standard Deviation:	33
Root Mean Square:	37

	WS Difference (m/s)	
Altitude	7/25/97 1500	7/26/97 1000
138	-2.7	-1.8
196	-3.1	-0.7
254	-3.5	-0.1
312	0.7	
370	0.0	
428	1.1	
486		
544		
602	0.6	-3.9
660	1.7	-6.6
718	-1.5	-6.4
776	-1.3	-5.9
834	-1.1	-3.5
892	-1.6	-0.6
950	-1.5	0.0
1008	-1.6	0.0
1066	-1.6	4.0
1124	-1.1	5.1
1182		
1240	-0.9	4.5
1298	0.0	
1356	1.0	5.8
1414	1.4	6.7
1472	2.7	3.3
1530	1.7	0.6
1588	2.3	0.9
1646	0.3	1.2
1704	0.2	1.0
1762	-1.6	3.1
1820	-2.0	2.8
1878	-0.9	4.7
1936	0.2	5.3
1994	-0.5	5.5
2052	1.0	6.6
2110	0.3	5.6
2168	-0.7	9.6
2226	-1.3	
Average:	-0.4	1.6
Maximum:	2.7	9.6
Minimum:	-3.5	-6.6
Std Dev:	1.5	4.2
RMS:	1.5	4.4

	WD Difference (deg)	
Altitude	7/25/97 1500	7/26/97 1000
138	2	44
196	8	-33
254	53	-42
312	10	
370	16	
428	13	
486		
544		
602	46	63
660	58	106
718	57	117
776	58	33
834	41	17
892	25	27
950	10	28
1008	10	33
1066	-9	15
1124	13	8
1182		
1240	30	-50
1298	18	
1356	14	-72
1414	16	-68
1472	11	-22
1530	12	-2
1588	-3	16
1646	-2	28
1704	1	32
1762	1	32
1820	7	31
1878	1	36
1936	0	47
1994	3	49
2052	-8	51
2110	-3	34
2168	1	8
2226	2	
Average:	15	20
Maximum:	58	117
Minimum:	-9	-72
Std Dev:	20	44
RMS:	25	47

Comments:

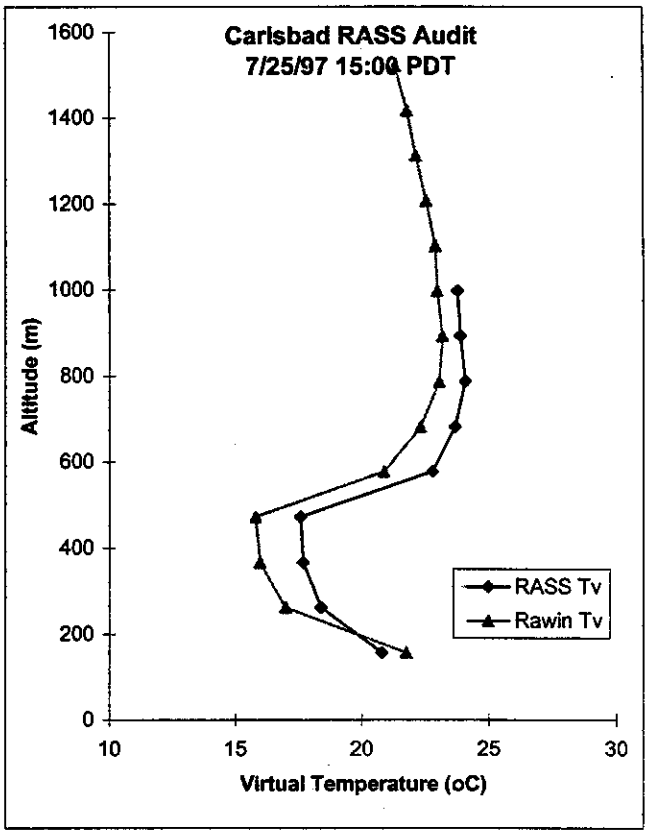
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 7/25/97
Start: 15:00 PDT
End: 15:43 PDT
Key Person: Cat Russell
Auditor: Alex Barnett

Site Name: Carlsbad
Project: Upper-Air Audit
Measurement Org.: NOAA

Instrument: ETL 915-32-7

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1417	9999	21.8	NA
1312	9999	22.2	NA
1207	9999	22.6	NA
1102	9999	22.9	NA
997	23.8	23.0	0.8
892	23.9	23.2	0.7
787	24.1	23.1	1.0
682	23.7	22.3	1.4
577	22.8	20.9	1.9
472	17.6	15.8	1.8
367	17.7	16.0	1.7
262	18.4	17.0	1.4
157	20.8	21.8	-1.0



Results Summary

Min. Diff. :	-1.0
Max Diff. :	1.9
Ave. Diff. :	1.1
Std. Dev. :	0.9

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	2000974
Td offset (oC):	-2.0
RH offset (%)	5.0
Sonde Pressure (mb):	1001.6
Ref Pressure (mb):	1001.3
Difference (mb):	0.3

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

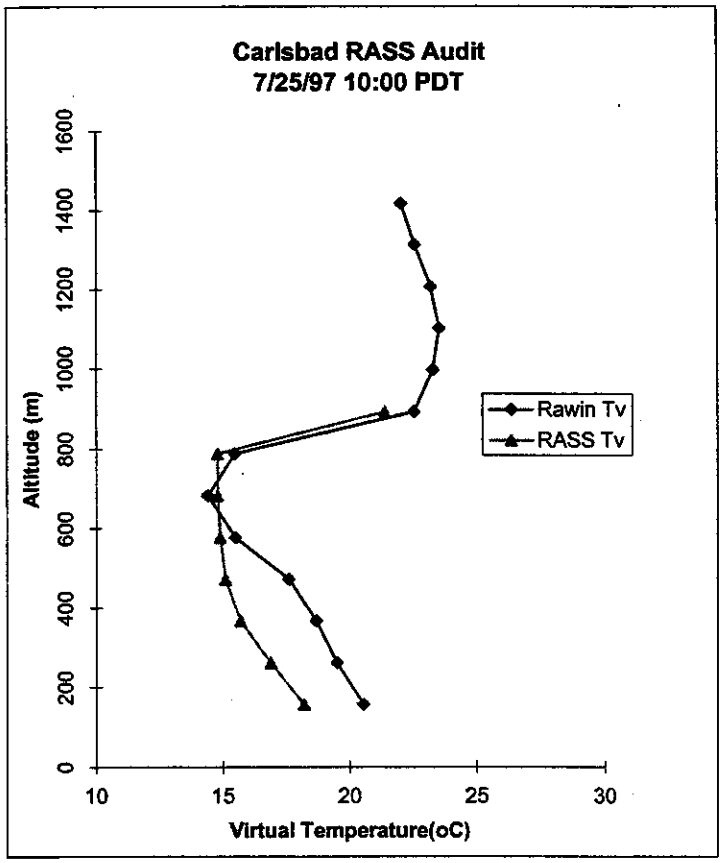
AeroVironmnet Environmnetal Services Inc.
Audit Report
RASS Summary

Date: 7/26/97
Start: 10:00 PDT
End: 10:39 PDT
Key Person: Cat Russell
Auditor: Alex Barnett

Site Name: Carlsbad
Project: Upper-Air Audit
Measurement Org.: NOAA

Instrument: ETA 915-32-7

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1522	9999	21.5	NA
1417	9999	22.1	NA
1312	9999	22.6	NA
1207	9999	23.2	NA
1102	9999	23.5	NA
997	9999	23.3	NA
892	21.4	22.5	-1.1
787	14.8	15.5	-0.7
682	14.8	14.4	0.4
577	14.9	15.5	-0.6
472	15.1	17.6	-2.5
367	15.7	18.7	-3.0
262	16.9	19.5	-2.6
157	18.2	20.5	-2.3



Results Summary

Min. Diff. :	-3.0
Max Diff. :	0.4
Ave. Diff. :	-1.6
Std. Dev. :	1.2

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	2000683
Td offset (oC):	0.8
RH offset (%)	6.0
Sonde Pressure (mb):	1000.9
Ref Pressure (mb):	1000.8
Difference (mb):	0.1

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

EL MONTE (EMT)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	El Monte (EMT)
Audit Dates:	July 28 - 30, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Reggie Smith
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site operator is the CARB technician who has operated RWP and RASS for a number of field programs and is very familiar with the systems.

Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is located in the extreme northeast corner of the El Monte Airport approximately eight feet below the level of Lower Azusa Road, that runs along the north side. Low hangers form the south boundary for the site approximately 75 meters away. The east exposure consists of a retaining wall that is topped by a chain-link fence and bushes.

SYSTEM AUDIT NOTES

1. The audit determined the orientation of the RWP antenna to be 350°. The RWP setup was 345°. Following the audit, the site operator changed the antenna orientation to 350°. No further action is required.
2. Acoustic source level: The north, east, and west acoustic source antenna levels exceeded the EPA PAMS recommended level criteria of ± 1.0°. The acoustic sources should be leveled as soon as possible.
3. The RASS acoustic temperature and acoustic source ranges were set too low for the expected temperature ranges in the El Monte area. They were adjusted to more suitable ranges following the audit. No further actions are required.
4. The RASS range gate spacing is set to 100 meters. For the purposes of an air quality study, it is recommended the RASS be operated at a finer resolution (about 60 m), while retaining the altitude coverage.

5. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.
6. The RASS measurements are restricted to between 08:00 and 21:00 hours PST due to neighbor complaints.

POTENTIAL ACTIVE NOISE SOURCES

No active noise sources were detected by a scan of the radio frequencies and a listen only check.

POTENTIAL PASSIVE NOISE SOURCES

1. The movement of the automobiles on Lower Azusa Road toward the north to northwest.
2. The trees that line Lower Azusa Road toward the northwest.

ANTENNA LEVEL AND ALIGNMENT

1. The audit determined the orientation of the RWP antenna to be 350°. The RWP setup was 345°. Following the audit, the site operator changed the antenna orientation to 350°.
2. Antenna level: NW = 0.2°, SW = 0.2°. Okay.
3. Acoustic source level: The north, east, and west acoustic source antenna levels exceeded the EPA PAMS recommended level criteria of ± 1.0°.

RADAR PROFILER PERFORMANCE AUDIT

RWP - Sodar Comparison

Sodar data was collected at the El Monte site between 12:00 hrs. PDT on 7/28/97 and 8:00 hrs. PDT on 7/30/97, but the comparison was only possible for the hours 12:00 hr. PDT to 12:00 hr. PDT on 7/29/97 because of the RWP locking up as a result of changes made to the RASS operating parameters. This problem was not discovered until after the audit was complete on 7/31/97. The sodar data was collected at 30 meter intervals to a maximum altitude of 750 meters. The sodar data was spatially averaged to correspond with the RWP low mode data range gates of 110, 166, 221, 276, 331, 387, 442, 497, 552, 608, and 663 meters. They were also spatially averaged to match the high mode range gates or 117, 214, 311, 407, 504, and 601 meters. The overall sodar and validated RWP (level one) wind data compared as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	35	-5.6	60	-4.8
Standard Deviation:	90	6.1	88	6.1
Root Mean Squared:	96	8.2	106	7.7
Maximum Difference:	150	1.3	179	2.1
Minimum Difference:	-178	-23.3	-166	-21.6

The audit results showed that the RWP and sodar wind speed and wind direction average differences did not agree within the audit criteria of ± 10° for wind direction, and ± 1.0 m/s for wind speed. This lack of agreement did not indicate poor performance on the part of the RWP. Instead, the reason for the poor agreement between the audit sodar and the RWP was due to a combination of active and passive noise interference to the audit sodar data collection. The active noise sources were from aircraft and other vehicular traffic at the El Monte Airport, and a main thoroughfare (Santa Anita Avenue) that ran along the east side of the airport, approximately 100 yards from the sodar location. This noise interference limited the height to which the sodar could collect data or prevented the sodar from collecting data at all. The passive noise interference resulted from reflections of the sodar signal off nearby buildings because of limited siting alternatives at the airport that were suitable for sodar operations. The effect of the passive interference was to bias the component wind speeds to lower values at altitudes that corresponded to the distance that the reflective surfaces were from the sodar.

RWP - Rawinsonde Comparison

Rawinsonde soundings were conducted at the El Monte site on 7/28/97 at 1700 hours PDT, and 7/29/97 at 1000 hours, PDT. RWP wind data was not available for the 7/29/97 1000 PDT comparison because of the system malfunction as a result of resetting RASS data collection parameters.

Comparisons between the rawinsonde and the high mode RWP winds agreed well within the audit criteria of ±10° for wind direction, and ± 1.0 m/s for wind speed. The comparison between the rawinsonde and the RWP low mode winds marginally exceeded the ±10° audit criteria only because of the difference between the sodar and RWP wind at the 110 meter level. The audit results were as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	11	-0.3	5	-0.4
Standard Deviation:	41	1.2	34	1.5
Root Mean Squared:	41	1.2	33	1.5

Maximum Difference:	137	3.0	130	3.2
Minimum Difference:	-53	-1.8	-62	-3.3

If the differences for the low mode110 range gate, and the high mode 117 meter range gate are eliminated from the average difference calculations, the wind direction average difference for the low mode drops to 6° (well within the audit criteria), and the high mode wind direction average difference becomes zero. The reason for the large differences in the lowest range gates may be due to ground clutter caused by the trees and vehicular traffic on the adjacent street that runs along the north side of the site. The data reviewers should carefully review the data in the lowest range gates and flag or invalidate this data as necessary. The audit results with the low mode 110 meter, and high mode 117 meter average differences removed are as follows:

	Low Mode		High Mode	
	WD (deg)	WS (m/s)	WD (deg)	WS (m/s)
Average Difference:	6	-0.3	0	-0.4
Standard Deviation:	31	1.2	23	1.5
Root Mean Squared:	30	1.2	23	1.5
Maximum Difference:	66	3.0	52	3.2
Minimum Difference:	-53	-1.8	-62	-3.3

RASS PERFORMANCE AUDIT

The audit virtual temperature comparison data was provided by the pressure, temperature, and humidity data from the 7/28/97, 1700 hours PDT, and 7/29/97, 1000 hours PDT rawinsondes. The average difference for both soundings were well within the audit criteria of ± 1.0°C, although the comparison for the 7/29/97 1000 PDT sounding was based on only four data points. RASS data for this sounding was not available above the 428 meter range gate. The audit results were as follows:

	7/28/97 1700 PDT (oC)	7/29/97 1000 PDT (oC)
Average Difference:	0.4	0.5
Standard Deviation:	0.5	0.4
Maximum Difference:	0.9	1.3
Minimum Difference:	-0.3	0.0

RADAR PROFILER DATA INTERNAL CONSISTENCY

No problems noted.

RASS DATA INTERNAL CONSISTENCY

No problems noted.

SURFACE METEOROLOGY SYSTEM AUDIT

1. An audit of these measurements was not possible since It was not possible to reach the sensors.
2. The wind sensors were obstructed by the retaining wall, bushes, and trees on the east side of the site. The arc of unobstructed flow for these measurements was between 180° and 200°.
3. The temperature and relative humidity sensors were obstructed and/or influenced by the retaining wall, bushes, and trees on the east side of the site.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	CARB
SITE NAME AND LOCATION:	El Monte (EMT)
AUDITOR:	Alex Barnett
DATE:	July 28 - 30, 1997
KEY PERSON:	Reggie Smith

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar profiler	Radian	LAP-3000	Rx/Tx: 7183 Interface: 7203	Lo 110-1436 m at 55 m inc. Hi 117-3307 m at 106 m inc.
Virtual Temperature	RASS	Radian	LAP-3000	Rx/Tx: 7183 Interface: 7203	112 - 1477 m at 105 m inc. (see below)
	Audio Amplifier	Peavey	CS-800X	07674672	
Wind Speed		Met One	010C	P1069	0 - 50 m/s
Wind Dir.		Met One	020C	P3075	0 - 540°
Amb. Temp.		Met One	060-A	P8701	
Rel. Hum.		Met One	083	P6319	0 - 100%
	Data Logger	ESC	8800	1471	

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Radar panel	Ball	915 MHz	0116-0119	
Final amplifier	Radian		CARB 1	
Audio amp.	Peavey	CS-800X	07674672	
Interface	Radian	LAP-3000	7203	
Receiver/Mod.	Radian	LAP-3000	7183	
Radar Comp.	IBM	486DX2/Tp	23CHCZB	
Gateway Comp	IBM	486DX2/Tp	23CHKPW	
Data logger	ESC	8800	1471	

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Ear defenders				
Bubble level				
Ladder				

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler and RASS

Variable	Value	Meet SOP (Yes/No)
1. Orientation	345°	No
2. Level	NW: 0.2° SW: 0.2°	Yes
3. Distance to closest obstruction	None	Yes
4. Distance to closest active noise source	100'	No[1]

Comments:

1. Traffic on Lower Azusa Road and trees that line Lower Azusa Road toward the north and northwest.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 meters	Yes
2. Distance to nearest obstacle	20'[1]	No
3. Is separation at least 10x obst. Height?	Yes	Yes
4. Are instruments on a rooftop?	Yes	Yes
5. Is exposure 1.5X height above the roof?	Yes	Yes
6. Arc of unrestricted flow?	200°	No
7. Height of temp sensor above ground.	10 meters	Yes
8. Distance of temp sensor from obst.	20'[2]	yes
9. Hgt of Dew pt/RH sensor above ground.	10 meters	Yes
10. Distance Dew pt/RH sensor from obst.	20'[2]	No
11. Are the distances 4X from obst. Hgt.?	No	No
12. Is sensor shielded/motor asp?	Yes	Yes
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the on site equipment and the monitoring plan?	No	Yes

Comments:

1. Trees to the east of the site are closer than the EPA recommended criteria of 10 times the height of the potential obstruction.
2. The trees to the east of the site are closer than the EPA recommended criteria of 4 times the height of the obstruction.

III. Operation

A. Radar Profiler, RASS, and Surface Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	NA	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments:

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler Settings

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Software version?	POP-3 v1.41B	Yes
2.	High mode wind pulse length?	700 ns	Yes
3.	Low mode wind pulse length?	400 ns	Yes
4.	RASS pulse lenght ?	700 ms	Yes
4.	Time zone	PST	No
5.	RASS acoustic temperature range ?	36.18 to -5.18°C	No[1]
6.	RASS acoustic source range ?	-0.05 to 35.06°C	No[2]
7.	Wind data consensus	55 minutes	Yes
8.	RASS consensus	5 minutes	Yes

Comments:

1. Range was too low for the season and location. It was adjusted to 40.0 to 5.0°C.
2. Range was too low for the season and location. It was adjusted to 5.0 to 40.0°C.

	Wind Low Mode	Wind High Mode	RASS
First Gate	0.12 km	0.13 km	0.11 km
Last Gate	1.56 km	3.59 km	1.48 km
Spacing	60.0 m	105.0 m	105.0 m
Full Scale Velocity	10.5 m/s	10.2 m/s	409.8 m/s

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

C. Auxiliary Equipment

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	No[1]	See below
3.	Is the site temperature maintained at 20-30°C?	yes	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	yes
6.	Does the telephone work?	Yes	yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

1. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

C. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes[1]	Yes
2.	Are the station logs up to date?	Yes[1]	Yes
3.	Do station logs contain details as required by the SOPs?	Yes[1]	Yes
4.	Are routine checklists used?	Yes[1]	Yes
5.	Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6.	Are the calibration forms present?	Yes	Yes
7.	Do the calibration forms contain details as required by the SOPs?	Yes	Yes
8.	Are the SOPs present?	Yes	Yes
9.	Are the instrument manuals present?	Yes	Yes
10.	Do the SOPs include quality control tests?	Yes	Yes
11.	If quality control tests are included then how are the results of the tests documented?	On Maint. Sheet	Yes
12.	Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13.	Is the site visited twice weekly?	Twice monthly[2]	Yes
14.	Does the site technician understand the SOPs?	Yes	Yes

Comments:

1. The LAP-3000 Monthly Maintenance Sheet is used to record all checks performed and action taken.
2. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments: No paper work.
2.	How are data stored?	Computer hard disk
3.	How often are the data backed up?	Polled daily by Sacramento Office.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	Yes	Yes
2.	Is preventive maintenance being performed?	Yes	Yes
3.	Are field operators given special training in preventive maintenance?	Yes	Yes
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5.	Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes[1]	Yes
2.	Does the siting meet the program objectives?	Yes[2]	Yes
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?	Yes[3]	Yes
6.	Overall, does the data appear to meet the program objectives?	Yes[3]	Yes

Comments:

1. Since the site is visited approximately every four weeks for routine maintenance, there is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

2. The proximity of Lower Azusa Road to the north of the site presents potential clutter in the data.
3. Although the data quality has improved markedly since the replacement of the preamplifier, it will have to be screened carefully during the validation process.

   It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	El Monte	Instrument:	LAP-3000
Date:	7/28/97 - 7/30/97	Receiver s/n:	7183
Time:		Interface s/n:	7203
Measurements group:	CARB	Frimware version:	POP-3
Key contact:	Reggie Smith	System rotation angle:	345° True
Audited by:	Alex Barnett	Measured orientation:	350° True
Site longitude:	118° 01.75'W	Orientation difference:	-5°
Site latitude:	34° 05.50'N	Array level:	NW: 0.2 °
			SW: 0.2 °
Site elevation:	90 meters	Beam zenith angle:	
Magnetic declination:	14°E	Beam directions:	NW and SW

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	5	Moderate traffic 15m away
NA	30	5	Moderate traffic 15m away. Tall Sign (30m) 100m away
NA	60	5	Moderate traffic 25m asay.
NA	90	30	Retaining wall next to site Bushes on wall 5-6m above site.
NA	120	45	Retaining wall next to site Bushes on wall 5-6m above site. Telephone pole 20m above site, 30m away.
NA	150	45	Retaining wall next to site Bushes on wall 5-6m above site. Tree 20m above site, 40m away.
NA	180	30	Retaining wall next to site Bushes on wall 5-6m above site. Power pole 15m above site, 100m away.
NA	210	<2	Low aircraft hangers 150m away.
NA	240	<2	Low industrial building ~½ mile away.
NA	270	5	Low aircraft hangers 150m away
NA	300	30	Moderate traffic and tree 10m tall, 50 meter away
NA	330	30	Moderate traffic 50m away, tree 15m tall, 75m away

Comments:

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: El Monte
Date: July 28 - 30, 1997
Measurements Group: CARB
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	60
Maximum:	179
Minimum:	-166
Standard Deviation:	88
Root Mean Square (RMS):	106

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)					
Date	Hour	117	214	311	407	504	601
07/28/97	12:15			57			
	13:15			133			
	14:15			142			
	15:15						
	16:15			129			
	17:15	110	49				
	18:15		40	-113			
	19:15		31				
	20:15						
	21:15		-154		-26	-39	
	22:15	163	170				
	23:15			-72	125	104	121
7/29/97	0:15			27	132	128	179
	1:15				128		
	2:15				113	121	110
	3:15				85		
	4:15				139	139	
	5:15				36	78	-166
	6:15						
	7:15		112	14			
	8:15						
	9:15			63			
	10:15			79			
	11:15	117	-64		-60	-44	-19
	12:15		64	98			
	Average:	130	31	51	75	70	45
	Maximum:	163	170	142	139	139	179
	Minimum:	110	-154	-113	-60	-44	-166
	Std Dev:	29	100	83	74	78	138
	RMS:	132	99	94	102	100	132

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: El Monte
Date: July 28 - 30, 1997
Measurements Group: CARB
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operations

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-4.8
Maximum:	2.1
Minimum:	-21.6
Standard Deviation:	6.1
Root Mean Square (RMS):	7.7

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)					
Date	Hour	117	214	311	407	504	601
07/28/97	12:15			1.3			
	13:15			-0.4			
	14:15			-9.5			
	15:15						
	16:15			-1.6			
	17:15	1.2	2.1				
	18:15		-1.7	-2.4			
	19:15		1.2				
	20:15						
	21:15		-1.0		-1.2	-2.0	
	22:15	0.1	-1.0				
	23:15			-16.1	-2.7	-3.2	-3.0
7/29/97	0:15			0.0	-2.8	-4.7	-9.0
	1:15				-3.9		
	2:15				-9.7	-13.6	-12.8
	3:15				-6.7		
	4:15				-5.5	-10.4	
	5:15				-2.2	-6.8	-5.2
	6:15						
	7:15		-1.8	-4.6			
	8:15						
	9:15			0.2			
	10:15			0.2			
	11:15	-1.0	-1.7		-21.0	-19.2	-21.6
	12:15		0.5	-3.0			
	Average:	0.1	-0.4	-3.3	-6.2	-8.5	-10.3
	Maximum:	1.2	2.1	1.3	-1.2	-2.0	-3.0
	Minimum:	-1.0	-1.8	-16.1	-21.0	-19.2	-21.6
	Std Dev:	1.1	1.5	5.2	6.1	6.2	7.3
	RMS:	0.9	1.4	6.0	8.5	10.3	12.2

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: El Monte
Date: July 28 - 30, 1997
Measurements Group: CARB
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Dir. (deg)
Average:	35
Maximum:	150
Minimum:	-178
Standard Deviation:	90
Root Mean Square (RMS):	96

Low Mode of Operation

		Wind Dir. Difference (deg, Radar Profiler - Sodar) Level (m)										
Date	Hour	110	166	221	276	331	387	442	497	552	602	663
07/28/97	12:15											
	13:15		-171	-32								
	14:15		82									
	15:15											
	16:15											
	17:15	86	66	40	18							
	18:15		26	33	18							
	19:15											
	20:15				-4							
	21:15			117	146	-1	41	52	136	-12		
07/29/97	22:15	150		-178		-165	81					
	23:15				10		104	77	86	97		
	0:15				33	56	101	74		86	82	43
	1:15				107	126	136	94				65
	2:15				148	120	106	120	121	116	112	59
	3:15					122	42	75				
	4:15				32	-70	-158	47	129	145		
	5:15						50		70	117	-174	
	6:15				-118							
	7:15			-157								
	8:15											
	9:15											
	10:15											
	11:15	89	99	-94	-82	-94	-68	-57		-80	-16	-10
	12:15			-33	-39							
	Average:	108	21	-38	22	12	44	60	108	67	1	39
	Maximum:	150	99	117	148	126	136	120	136	145	112	65
	Minimum:	86	-171	-178	-118	-165	-158	-57	70	-80	-174	-10
	Std Dev:	36	110	101	82	112	91	53	29	82	129	34
	RMS:	112	101	102	81	106	96	78	112	101	112	49

SCOS97-NARSTO Audit Report
Radar Profiler - Sodar Wind Speed Comparison

Site: El Monte
Date: July 28 - 30, 1997
Measurements Group: CARB
Radar Profiler: Radian Inc. Model Lap-3000
Audit Sodar: AeroVironment Model 2000

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-5.6
Maximum:	1.3
Minimum:	-23.3
Standard Deviation:	6.1
Root Mean Square (RMS):	8.2

Low Mode of Operation

		Wind Speed Difference (m/s, Radar Profiler - Sodar) Level (m)										
Date	Hour	110	166	221	276	331	387	442	497	552	602	663
07/28/97	12:15											
	13:15		-3.1	1.2								
	14:15		-0.5									
	15:15											
	16:15											
	17:15	-1.2	1.2	0.6	0.2							
	18:15		-0.8	-2.5	-5.1							
	19:15											
	20:15				-0.6							
	21:15			-2.0	-2.4	-2.1	-2.1	-0.9	-0.8	-4.3		
07/29/97	22:15	-0.5		-1.2		-1.5	-4.4					
	23:15				0.2		-7.3	-3.5	-3.6	-2.0		
	0:15				1.3	0.0	-2.1	-4.9		-5.8	-8.2	-9.8
	1:15				0.6	-3.0	-3.6	-4.4				-10.7
	2:15				-10.3	-8.7	-5.3	-11.7	-15.8	-11.0	-14.4	-13.4
	3:15					-2.5	-4.2	-8.9				
	4:15				-1.7	-2.4	-3.2	-9.3	-7.8	-10.2		
	5:15						-2.8		-6.7	-5.1	-5.2	
	6:15				-2.6							
	7:15			-2.2								
	8:15											
	9:15											
	10:15											
	11:15	-0.7	-0.8	-4.0	-15.8	-17.5	-23.3	-19.7		-19.7	-21.9	-22.1
	12:15			-1.8	-1.0							
	Average:	-0.8	-0.8	-1.5	-3.1	-4.7	-5.8	-7.9	-6.9	-8.3	-12.4	-14.0
	Maximum:	-0.5	1.2	1.2	1.3	0.0	-2.1	-0.9	-0.8	-2.0	-5.2	-9.8
	Minimum:	-1.2	-3.1	-4.0	-15.8	-17.5	-23.3	-19.7	-15.8	-19.7	-21.9	-22.1
	Std Dev:	0.4	1.6	1.7	5.1	5.8	6.3	5.9	5.7	5.9	7.4	5.6
	RMS:	0.9	1.6	2.2	5.8	7.2	8.4	9.7	8.6	10.0	14.0	14.8

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: El Monte
Date: July 28-29, 1997
Measurements Group: CARB
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-0.4
Maximum:	3.2
Minimum:	-3.3
Standard Deviation:	1.5
Root Mean Square:	1.5

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	5
Maximum:	130
Minimum:	-62
Standard Deviation:	34
Root Mean Square:	33

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-0.3
Maximum:	3.0
Minimum:	-1.8
Standard Deviation:	1.2
Root Mean Square:	1.2

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	11
Maximum:	137
Minimum:	-53
Standard Deviation:	41
Root Mean Square:	41

WS Difference (m/s)		
Altitude	7/28/97 1700	7/29/97 1000
117	-1.7	
214	3.2	
311	0.7	
408	1.1	
505	2.6	
602	0.7	
699	-0.3	
796	-0.5	
893	-0.4	
990	-1.3	
1087	-1.4	
1184	-0.6	
1281	-0.2	
1378	-1.5	
1475	-2.1	
1572	-3.3	
1669	-2.4	
1766	0.2	
1863	-0.5	
1960	-0.1	
2057	-1.8	
2154	-2.6	
2251	-0.4	
2348	0.9	
2445	0.8	
2542	0.3	
2639	0.3	
2736	0.2	
Average:	-0.4	
Maximum:	3.2	
Minimum:	-3.3	
Std Dev:	1.5	
RMS:	1.5	

WD Difference (deg)		
Altitude	7/28/97 1700	7/29/97 1000
117	130	
214	18	
311	52	
408	49	
505	-11	
602	-62	
699	-31	
796	-10	
893	-9	
990	20	
1087	27	
1184	15	
1281	9	
1378	18	
1475	1	
1572	-18	
1669	-14	
1766	-7	
1863	-7	
1960	-8	
2057	-15	
2154	-22	
2251	-10	
2348	-13	
2445	2	
2542	2	
2639	9	
2736	13	
Average:	5	
Maximum:	130	
Minimum:	-62	
Std Dev:	34	
RMS:	33	

WS Difference (m/s)		
Altitude	7/28/97 1700	7/29/97 1000
110	-1.7	
166		
221	-0.2	
276	-1.0	
331	0.0	
387	-1.6	
442	3.0	
497	1.7	
552	1.1	
608	1.2	
663	-0.1	
718	-0.9	
773	-0.1	
828	-0.5	
884	-0.7	
939	-0.3	
994	-1.8	
1049	-1.6	
1105	-1.0	
1160	-0.6	
1215	0.1	
1270	0.2	
1326	-0.4	
1381	-1.7	
Average:	-0.3	
Maximum:	3.0	
Minimum:	-1.8	
Std Dev:	1.2	
RMS:	1.2	

WD Difference (deg)		
Altitude	7/28/97 1700	7/29/97 1000
110	137	
166		
221	-40	
276	30	
331	38	
387	66	
442	56	
497	-16	
552	-44	
608	-53	
663	-28	
718	-11	
773	-19	
828	-3	
884	9	
939	24	
994	10	
1049	27	
1105	26	
1160	14	
1215	12	
1270	5	
1326	11	
1381	11	
Average:	11	
Maximum:	137	
Minimum:	-53	
Std Dev:	41	
RMS:	41	

Comments:

1. RWP data was not available during the 7/29/97 10:00 AM sounding.
2. The low mode RWP first range gate reading does not correlate well with the data for the rest of the sounding. It appears that this point should have been invalidated during the data validation process.

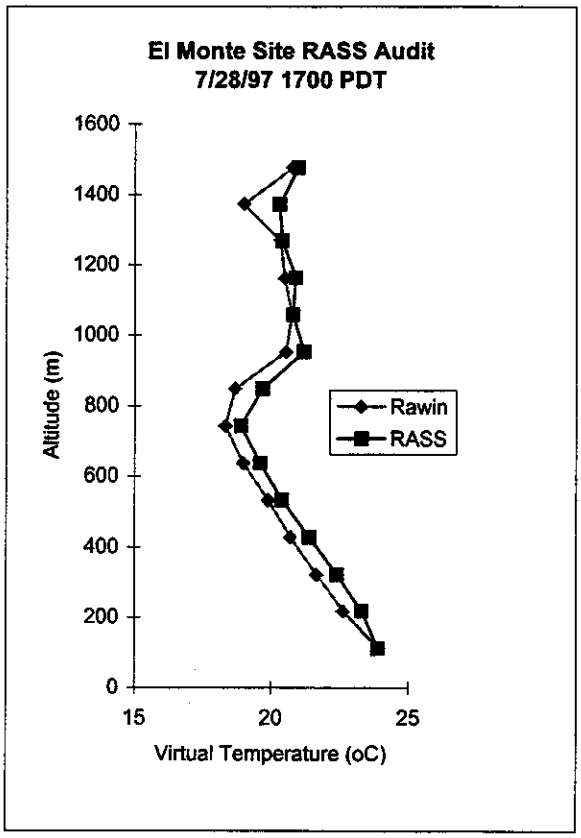
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/28/97
Start: 7:00 PDT
End: 7:46 PDT
Key Person: Reggie Smith
Auditor: Alex Barnett

Site Name: El Monte
Project: Upper-Air Audit
Measurement Org.: CARB

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1477	21.0	20.8	0.2
1372	20.3	19.0	1.3
1268	20.4	20.3	0.1
1163	20.9	20.5	0.4
1058	20.8	20.8	0.0
952	21.2	20.5	0.7
848	19.7	18.7	1.0
743	18.9	18.3	0.6
637	19.6	19.0	0.6
533	20.4	19.9	0.5
428	21.4	20.7	0.7
322	22.4	21.7	0.7
218	23.3	22.6	0.7
112	23.9	23.9	0.0



Results Summary

Average Difference:	0.5
Standard Deviation:	0.4
Maximum Difference:	1.3
Minimum Difference:	0.0

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535578
Td offset (oC):	-1.1
RH offset (%)	-3.0
Sonde Pressure (mb):	1003.3
Ref Pressure (mb):	1003.0
Difference (mb):	0.3

Comments:

1. The sonde data was vertically averaged to match the RASS levels.
2. The sonde Td and Tw offsets were included in the Tv calculations.

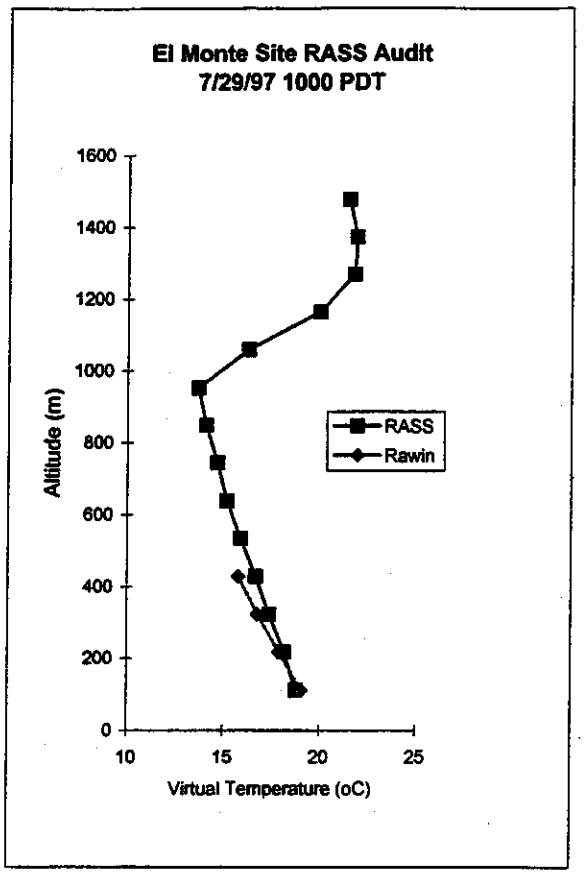
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/29/97
Start: 9:55 PDT
End: 0:34 PDT
Key Person: Reggie Smith
Auditor: Alex Barnett

Site Name: El Monte
Project: Upper-Air Audit
Measurement Org.: CARB

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Rawin Tv (oC)	Diff. (oC)
1477	21.5	9999	
1372	21.9	9999	
1268	21.8	9999	
1163	20.0	9999	
1058	16.3	9999	
952	13.7	9999	
848	14.1	9999	
743	14.7	9999	
637	15.2	9999	
533	15.9	9999	
428	16.7	15.8	0.9
322	17.4	16.8	0.6
218	18.2	17.9	0.3
112	18.8	19.1	-0.3



Results Summary

Average Difference:	0.4
Standard Deviation:	0.5
Maximum Difference:	0.9
Minimum Difference:	-0.3

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	2000652
Td offset (oC):	3.1
RH offset (%)	1.0
Sonde Pressure (mb):	1007.1
Ref Pressure (mb):	1006.0
Difference (mb):	1.1

Comments:

1. The sonde data was vertically averaged to match the RASS levels.
2. The sonde Td and Tw offsets were included in the Tv calculations.
3. The rawinsonde PTH data stream stopped collecting data between 486 and 1485 meters.

HESPERIA (HPA)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Hesperia (HPA)
Audit Dates:	June 20, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Tim Dye, Joe Guasti
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The audit was performed immediately following the STI training of the site technician. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is adjacent to a water tank on the west side of I-15. The view in the beam directions is clear with brush and low trees being the primary obstructions.

SYSTEM AUDIT NOTES

1. Power was not yet installed. Power during the audit was provided from an extension cord. To prevent instrument overheating, all instruments were turned off at the audit conclusion. Power is expected to be installed early during the week of June 23. No data will be collected until that time.
2. The surface wind measurements will not be accurate when winds are from the Southeast. The water tank will form an obstruction that exceeds the EPA siting criteria for distance from obstructions.
3. The site technician was unaware of the combination for the locks on the gate and trailer. The combination was provided during the audit.
4. There was some confusion in the reading of the site clock. 11:05 was read as 11:01 (the clock is analog with the numbers 1 through 12 around the clock face). Care should be taken in the reading of the clock.

5. Batch and processing files are being updated and as a result there was some confusion in locating the surface meteorological data file. It was indicated the new files will be in place in the next few days.
6. The radar level was checked in one direction. The level of the radar array should be checked in at least two directions.
7. It is recommended the site technician review the SOPs carefully and understand all needed steps before the next site check.
8. The RASS temperature range is from 2° to 36°C. The upper boundary should be increased to include temperatures that are normally expected in the desert environment.

POTENTIAL ACTIVE NOISE SOURCES

No problems noted. The radar was operated in a "listen only" mode and no problems were noted.

POTENTIAL PASSIVE NOISE SOURCES

Traffic on the adjacent highway could produce some clutter. To minimize this possibility the beam directions are aimed away from this potential source.

ANTENNA LEVEL AND ALIGNMENT

The system alignment differed from the audited direction by -5°. The site operator verified the difference and adjusted the software setting in the radar. The SSW RASS source level was off by 1.3°. This was corrected during the audit. No problems were found with the radar array level.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

The amount of data for review was limited because the site does not yet have power. The instruments were run on temporary power for the audit but will not be run continuously until permanent power and air conditioning are available. Power and air

conditioning are expected early in the week of June 23. The data reviewed did look reasonable.

RASS DATA INTERNAL CONSISTENCY

1. Data are limited due to the lack of power at the site. Of the data obtained, it looks reasonable. The height range was increased during the audit from 12 gates (780 m) to 20 gates (1280 m). Consideration should be given to raising it to 1560 meters.
2. As indicated above, given the anticipated range of temperatures in the desert, the RASS range should be adjusted to measure temperatures above 36°C.

SURFACE METEOROLOGY PERFORMANCE AUDIT

The relative humidity sensor failed the audit criteria. The site effective dew point temperature was 4.8° high, which is outside of the ±1.5°C criteria. The site relative humidity was 12% higher than the calculated audit relative humidity. This is also outside of the manufacturers' specifications. The sensor should be repaired or replaced.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	Sonoma Technology, Inc./Radian
SITE NAME AND LOCATION:	Hesperia (HPA)
AUDITOR:	Robert A. Baxter
DATE:	June 20, 1997
KEY PERSON:	Tim Dye/Joe Guasti

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	Radian Corp.	LAP-3000 Interface Receiver/ Modulator Profiler Monitor Antennas	NA	Lo 110 - 1429 m at 55 m inc. Hi 254 - 4006 m at 96 m inc.
Virtual Temperature	RASS	Radian Corp.	LAP-3000	NA	120 - 1260 m at 60 m inc. (see below)
	Audio amplifier	Peavey	CS-800X	NA	NA
10 m Wind Speed	Cup	Met One	010B		0 - 50 m/s
10 m Wind Direction	Vane	Met One	020B		0 - 540 degrees
2 m ambient temperature	RTD	Met One	060A	NA	-50 - 50 °C
2 m relative humidity	Solid State	Met One	083C	NA	0 - 100%
Data Logging	Digital	Odessa	DSM 3260	NA	NA

Comments: The RASS range was changed during the audit to about 1260 meters. The surface wind speed is reported in miles per hour. The indicated radar wind profiler hi mode was programmed on the day of the audit.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: The altitude operating range of the RASS should be increased further, if possible.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Modem	NA	NA	NA	NA
Gateway Computer and Monitor	NA	NA	NA	NA
Zip drive	Iomega	Parallel	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Clock	NA	Analog	NA	NA
Level	NA	NA	NA	NA
Ladder	NA	NA	NA	NA
Hearing Protection	NA	NA	NA	NA
Shovel	NA	NA	NA	NA
Flashlight	NA	NA	NA	NA
Tool Kit	NA	NA	NA	NA
Broom	NA	NA	NA	NA

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation	Radar -- -5° 10 m Vane -- 1°	Yes
2. Level	Radar -- <0.3° RASS -- 1.3°	Yes No
3. Distance to closest obstruction	Various trees, not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments: 1. The radar antenna orientation differed from the audit value by -5°. This was corrected during the audit.

2. One RASS source was out of level by 1.3°. This was corrected during the audit.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	~25 m	see below
3. Is separation at least 10x obst. height?	No	see below
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	340°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	trailer -- ~12 m	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	trailer -- ~12 m	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Aspirated	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: 2. Water tank ~25 m to the southeast is an obstruction to the flow.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	No	See below
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: Permanent power was not yet available for the site. Temporary power was used during the audit.

5. Did not want to move profiling equipment to get serial numbers.

6. The battery backup feature in the surface meteorological sensor data logger did not restore the clock to the proper time.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	96 m	Yes
3. Low mode pulse length	54 m	Yes
4. RASS pulse length	59 m	Yes
5. Time zone	PST	Yes
6. Wind data consensus	55 min	Yes
7. RASS consensus	5 min	Yes

Comments: The RASS temperature range is from 2° to 36°C. The upper boundary should be increased to include temperatures that are normally expected in the desert environment.

	Wind Low Mode	Wind High Mode	RASS
First Gate	110 m	254 m	120 m
Last Gate	1429 m	4006 m	1260 m
Spacing	55 m	96 m	60 m
Full Scale Velocity	10.2	10.2	NA

Comments: The RASS range was changed during the audit to 1260 meters. It is recommended the RASS be operated to a higher altitude. The Hi mode winds were set to 4006 meters from 3525 meters during the audit. It is unknown if it was changed back.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	No	No
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	No	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes	Yes (see below)
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	No	No

Comments: 1, 2, 3, 8. Permanent power and A/C was not available yet for the shelter. When power is available the site will be left on and should function acceptably.

7. The site is secure but the technician was unaware of the gate lock combination. The combination was provided during the audit.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	Yes	See below
12. Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at STI and Radian.

9. Manuals are maintained at STI and Radian. If repairs are needed then the technician brings the manuals to the site.

11. Documentation of the QC test results were not specifically addressed. The QC test results should be placed in the maintenance checklist log.

13. The site is visited every two weeks for routine maintenance. In between the visits the data are polled and reviewed daily.

14a. There was some confusion in the reading of the site clock. 11:05 was read as 11:01 (the clock is analog with the numbers 1 through 12 around the clock face). Care should be taken in the reading of the clock.

14 b. The radar level was checked in one direction. The level of the radar array should be checked in at least two directions.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every two weeks with all data archived and paperwork forwarded to STI in pre addressed envelopes.
2. How are data stored?	Data are stored locally on the computer hard drives with CDF files downloaded on a daily basis.
3. How often are the data backed up?	All data (CDF, moments) are copied to Zip disks every two weeks and shipped to STI.

Comments: Batch and processing files are being updated and as a result there was some confusion in locating the surface meteorological data file. It was indicated the new files will be in place in the next few days.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	See below
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	Yes (see below)
6. Overall, does the data appear to meet the program objectives?	See below	See below

Comments: 3. It is recommended the site technician review the SOPs carefully and understand all needed steps before the next site check.

5, 6. Data are limited due to the lack of power at the site. Of the data obtained, it looks reasonable. The height range on the RASS was increased during the audit from 12 gates (780 m) to 20 gates (1280 m). Consideration should be given to raising it to 1560 meters.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Hesperia	Instrument:	Radian LAP 3000
Date:	June 20, 1997	Receiver s/n:	NA
Time:	1000 PDT	Interface s/n:	NA
Measurements group:	STI	Firmware version:	POP 4
Key contact:	Tim Dye	System rotation angle:	242°
Audited by:	Bob Baxter	Measured orientation:	247°
Site longitude:	117° 24.79' W	Orientation difference:	-5°
Site latitude:	34° 23.42' N	Array level:	< 0.3°
Site elevation:	NA	Beam zenith angle:	23.6°
Magnetic declination:	15° (appx)	Beam directions:	332°, 242° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	3	No obstructions, low brush at ~60 m. Road at ~30 m.
NA	30	<2	
NA	56	8	Power pole at ~60 m.
NA	60	8	Power lines at ~50 m.
NA	90	10	Power lines at ~10 m.
NA	120	12	Antenna on top of adjacent building. Freeway at ~150 m.
NA	150	19	Water tank in fenced area.
NA	180	6	Fence and freeway at ~250 m.
NA	210	3	Power lines at ~2 - 3 km.
NA	240	<2	
NA	270	<2	
NA	300	3	Brush and trees at ~60 m.
NA	317	7	Joshua tree at ~50 m.
NA	330	3	Brush and dirt road ~60 m.

Comments: RASS level is off by 1.3° on the SSW source. This was corrected during the audit.

The antenna orientation was 5° low. The orientation was verified by the site operator and a correction made in the software following the audit.

The indicated features and distances were taken from the initial site review. The antenna is set up in the location where the April 8, 1997 measurements were performed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: June 20, 1997
Start: 1430 PDT
Finish: 1500 PDT
Auditor: Bob Baxter

Site name: Hesperia (HPA)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Sensor s/n: NA
K factor: 1.4
Range: 0 - 50 m/s
Logger: Odessa
Logger s/n: DSM-3260
Prop s/n: NA

Model: 010B
Sensor Ht.: ~10 m
Starting torque: 0.3 gm-cm
Starting Threshold: 0.46 m/s

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Last calibration date: unknown

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.3	#N/A	#N/A	0.3	0.0	#N/A
2	5.7	#N/A	#N/A	5.8	0.1	1.2
3	11.9	#N/A	#N/A	12.0	0.1	1.2
4	21.6	#N/A	#N/A	21.6	0.0	0.1
5	32.2	#N/A	#N/A	32.2	0.0	-0.1
6	42.9	#N/A	#N/A	42.8	-0.1	-0.2

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Data logger reports in miles per hour. Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: June 20, 1997
Start: 1100 PDT
Finish: 1430 PDT
Auditor: Bob Baxter

Site name: Hesperia (HPA)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
K Factor: 28.4
Range: 0 - 540°
Logger: Odessa
Logger s/n: DSM-3260

Model: 020B
Sensor Ht.: ~10 m
Starting torque: 4.0 gm-cm
Starting threshold: 0.38 M/S

Last calibration date: unknown

Crossarm: 1 deg true

Cal. Factors

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	1.0				360.0		-1.0
1	360	361.0	#N/A	#N/A	360.0	0.8	-1.0
2	90	91.0	#N/A	#N/A	89.0	-0.2	-2.0
3	180	181.0	#N/A	#N/A	178.0	-1.2	-3.0
4	270	271.0	#N/A	#N/A	270.0	0.8	-1.0
5	360	361.0	#N/A	#N/A	360.0	0.8	-1.0
6	450	451.0	#N/A	#N/A	448.0	-1.2	-3.0
7							
8							
9							
10							
11							
Avg difference:							-1.8
Maximum difference:						-1.2	-3.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor passed criteria.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: June 20, 1997
Start: 0940 PDT
Finish: 0957 PDT
Auditor: Bob Baxter

Site name: Hesperia (HPA)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: -50 - 50 Deg C

Model: 060A
Sensor Ht.: ~10 m

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	4.7	#N/A	#N/A	4.7	0.0
2	21.3	#N/A	#N/A	21.4	0.1
3	41.4	#N/A	#N/A	41.6	0.2

Criteria: +/- 0.5 degree Celsius

Comments: none

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: June 20, 1997
Start: 0915 PDT
Finish: 0930 PDT
Auditor: Bob Baxter

Site name: Hesperia (HPA)
Project: SCOS97-NARSTO
Operator: Radian/STI
Site Operator: T. Dye

Sensor Mfg: Met One
Serial No.: NA
Range: 0 - 100 Percent

Model: 083C
Sensor Ht.: ~10 m (on bldg)

Logger: Odessa
Logger s/n: DSM-3260

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	30.2	5.2	#N/A	#N/A	#N/A	42.0	10.1	4.8

Criteria: +/- 1.5 degree Celsius

Comments: Sensor failed criteria. Multiple readings were taken to verify the results. All showed roughly the same differences.

LOS ALAMITOS (LAS)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Los Alamitos (LAS)
Audit Dates:	July 16, 1997
Instrumentation Audited:	Sodar, Radar Wind Profiler, RASS, Surface Meteorology
Key Person(s):	Brian Templeman
Auditor:	Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

Some difficulties were encountered in finding the appropriate responding variables for the sodar. These were resolved after determining the sodar had rejection algorithms for extremely consistent frequencies in the received audio spectrum. Since the Acoustic Pulse Transponder (APT) provides very consistent responses, the APT signal was rejected as a non atmospheric return after one averaging interval had been sampled. No other problems were encountered.

SITE CHARACTERISTICS

The site is located adjacent to the runway at the Los Alamitos Naval Air Station facility. Exposure of the meteorological sensors is good but local agricultural activities tend to leave much dust on all equipment.

SYSTEM AUDIT NOTES

1. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
2. There are no signs warning of potential radio frequency radiation. Appropriate signage is recommended.
3. The surface wind sensor was found to be misoriented by 7°. The orientation was corrected following the audit.

4. Minimal checks of the surface meteorological instrumentation had been performed since the initial setup. Logs were filled out for the sodar and radar wind profiler and RASS, but none for the surface sensors. The initial log sheet did not have a site name, date, operator or time information. Better record keeping and more consistent site checks are recommended.
5. The site environment is very dusty due to the nearby agricultural operations. At the time of the audit the solar panel and other sensors were dirty. More frequent cleaning and inspection of the instruments is recommended.
6. The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.
7. The radar wind profiler was changed from an operational frequency of 924 MHz to 915 MHz the day before the audit. This seemed to cure the interference problems observed when operating at 924 MHz.
8. The RASS is currently using about a 3.5 minute consensus average, with the other 1.5 minutes used in data transfer. Unlike the other systems in the network, the current software in the radar profiler allows selection of either a 5 minute or 10 minute period for the RASS, with no interim periods available (7 minute is desired). The radar manufacturer should be contacted to determine how a 7 minute period can be selected. This will allow consistency among the systems in the network.
9. While there is a telephone line at the site for the modem, there was no telephone. Addition of a site telephone is recommended to aid in the site communications.
10. The header information in the sodar data is incorrect. It lists the site information for the BAO tower. The proper information should be entered into the header.

POTENTIAL ACTIVE NOISE SOURCES

There are several sources of noise that could affect the sodar operation. The most significant is an air conditioner on the adjacent trailer (about 5 meters from the sodar antenna. One sodar beam was aimed into the air conditioner. The broad band noise in the direction of the air conditioner averaged about 60 dBA, as opposed to 52 to 54 dBA in the other potential beam directions. A sampling of the spectral noise in the direction of the air conditioner showed active noise around the sodar operational frequency (the sodar frequency is 1889 Hz). Most significant was a band at about 1900 Hz. A quick review of the on-site data (described below) showed the sodar is seriously affected by the noise in the wind levels above about 250 to 300 meters. Aiming the beam away from the air conditioner may not help the problem because the interference is also seen in the vertical beam. The noise from the air conditioner needs to be minimized in order

to achieve reasonable data in the upper ranges of the sodar. Another possibility is to move the operating frequency to about 2400 Hz where the air conditioning frequency spectra was a minimum. However, the best alternative is to separate the noise source from the sodar.

Other active noise sources that could affect the sodar include broad band noise from the aircraft and helicopter operations at the airport and agricultural operations in the adjacent fields. These sources would tend to decrease the altitude capabilities of the sodar.

No significant active noise sources were observed in the radar operational frequency of 915 MHz.

POTENTIAL PASSIVE NOISE SOURCES

In the direction of the south sodar beam is a radar complex that may show reflections in the lowest range gate of the sodar. This is the beam that is aimed over the trailer air conditioner. If the beam is switched to the north then there may be some hangars and other buildings to the north at a distance of about 1 km, which is outside the range of the sodar.

No significant passive sources are apparent for the radar profiler other than aircraft that take off and land in the directions of the beams.

ANTENNA LEVEL AND ALIGNMENT

No problems noted for either the sodar or radar wind profiler.

SODAR PERFORMANCE AUDIT (APT)

The simulated signal provided by the APT provided a 180° wind shift through a 115 meter layer with the shift starting at 329 meters and ending at 444 meters. Consistent winds above and below this layer then tested the ability of the sodar to calculate the appropriate wind speeds and directions. Results of the Acoustic Pulse Transponder (APT) audit showed the sodar responded within criteria for the wind and altitude calculations. However, the sodar did show a smoothed profile at the level of the wind shear. The smoothing was a result of the oversampling performed using a 250 ms pulse length and a fine range gate resolution of 20 meters. Even though the reported data will be every 20 meters, it should be recognized there will be a running average, or smoothing, between the levels through about two to three range gates. This should not be considered a problem because the longer pulse length helps to achieve a higher altitude capability.

RASS PERFORMANCE AUDIT

The rawinsonde data were not available at the time of this summary preparation.

SODAR DATA INTERNAL CONSISTENCY

Daytime sodar data looks reasonable. However, a quick comparison between the sodar and radar wind profiler data showed what appeared to be higher magnitude speeds in the sodar data, while the general wind directions looked reasonable. A further evaluation of the sodar data showed what appeared to be higher than expected vertical velocities in the upper levels. For example, at 1000 GMT (0300 PDT) on July 17, vertical velocities of greater than 1 m/s at about 300 meters were observed. This is not reasonable for nighttime hours. Subsequent hours showed similar patterns. A review of two other days showed similar patterns with higher than expected vertical velocities starting at around 300 meters. It is suspected the fixed frequency rejection algorithms are not working on the potential noise generated by the shelter air conditioner. There is enough mixing of the A/C noise and ambient signals that an apparent peak is picked that is not truly representative of the atmospheric echoes. The fact that it is seen in the vertical antenna, and all data is vertical velocity corrected, means all data will be affected, regardless of the beam directions.

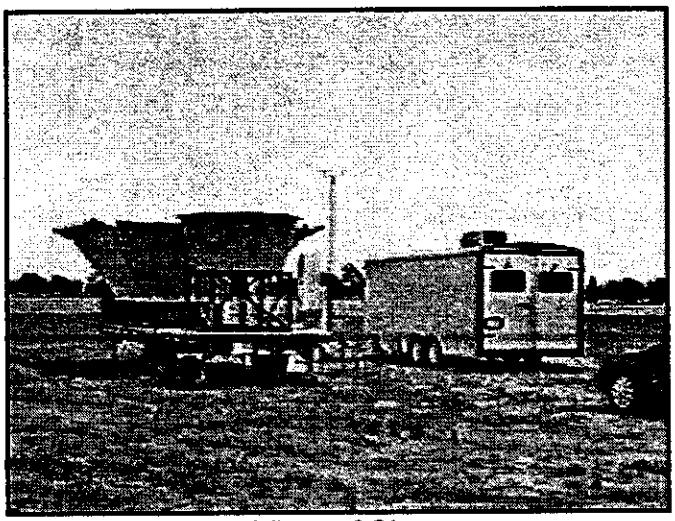
It is recommended a further review of the data should be performed to confirm the interference problem and consideration given to either moving the shelter further away from the antennas or placing a barrier between the air conditioner and the antennas to minimize the noise interference.

SURFACE METEOROLOGY PERFORMANCE AUDIT

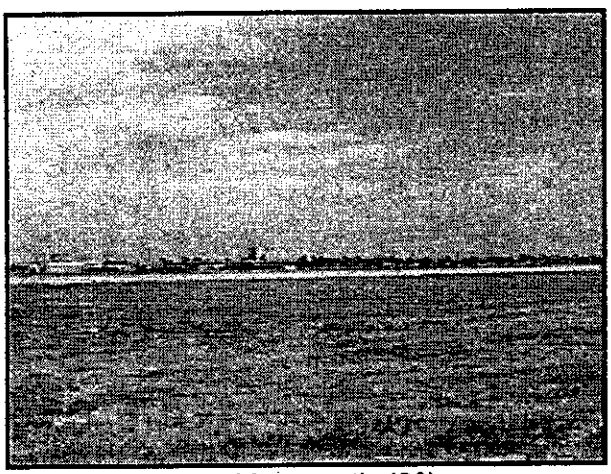
All sensors are scanned every 10 seconds with five minute averages recorded. A summary of significant audit findings is provided below:

1. Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the system to perform the torque tests.
2. Wind data recorded include scalar wind speed and resultant vector wind direction.
3. The wind direction vane orientation was found to be outside criteria causing directions to read about 7° high. The orientation was corrected during the audit.
4. The temperature probe could not be immersed in water baths and the design was not conducive to immersion in a water proof sheath. The audit therefore consisted of a single point comparison, which produced acceptable results.
5. While not included in the scope of the audits, the orientation of the sonic anemometer was checked and found to be aimed at 358°.

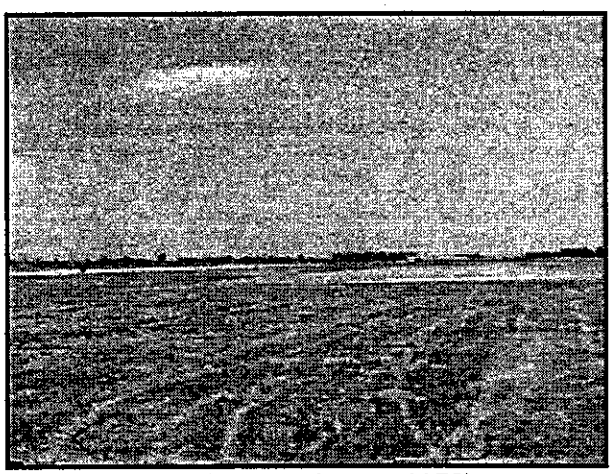
Los Alamitos Site
Photographs



View of Site

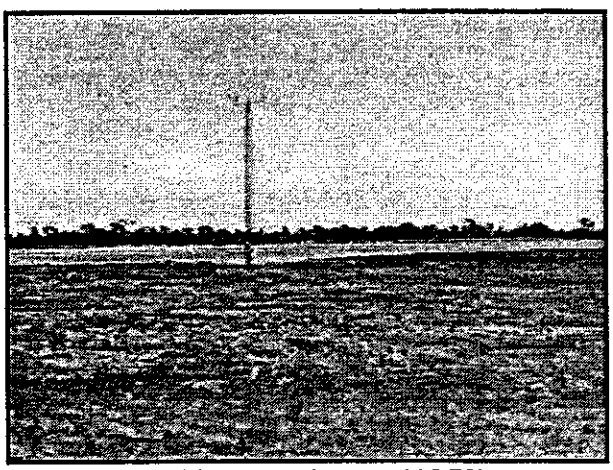


Looking north (0°)

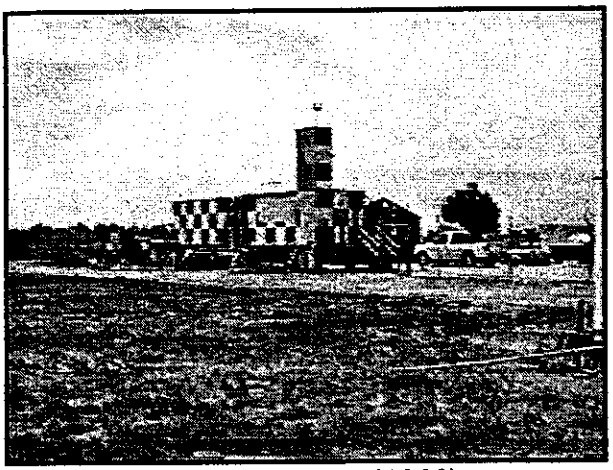


Looking northeast (45°)

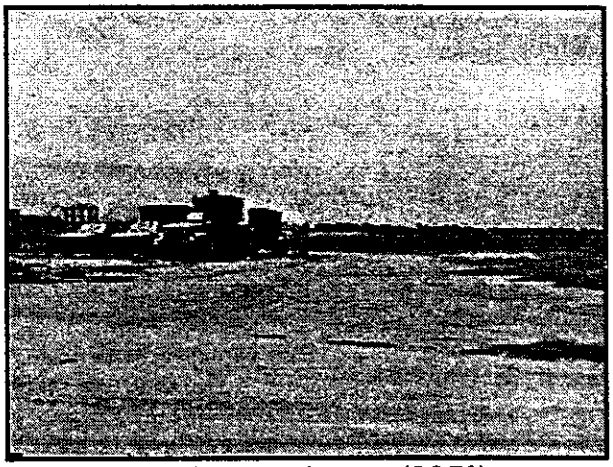
Looking east (90°)



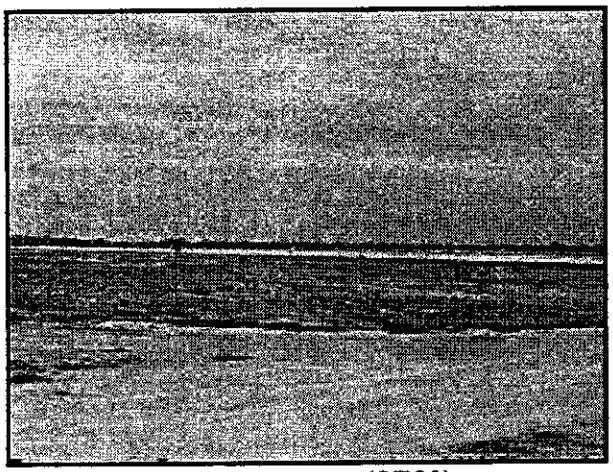
Looking southeast (135°)



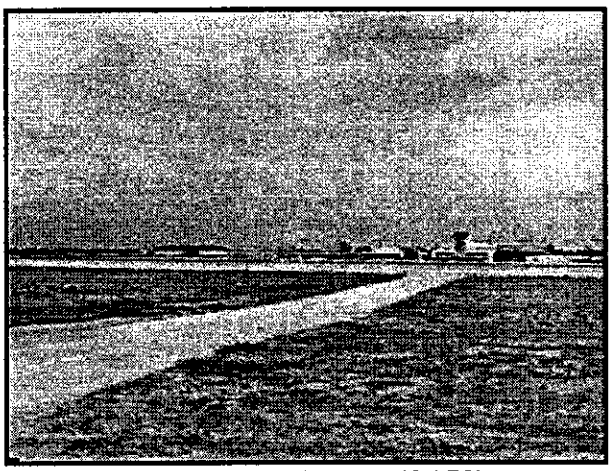
Looking south (180°)



Looking southwest (225°)



Looking west (270°)



Looking northwest (315°)

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Las Alamitos (LAS)
AUDITOR:	Robert A. Baxter
DATE:	July 16, 1997
KEY PERSON:	Brian Templeman

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Sodar	Radian Corp.	Echosonde 600PA	NA	20 - 400 m in 20 m inc.
Wind Speed/ Wind Direction	Radar Profiler	Radian Corp.	LAP-3000	NA	Lo 110 - 2144 m at 55 m inc. Hi 144 - 3704 m at 96 m inc.
	Audio amplifier	NA	NA	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor	NA	0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor	NA	0 - 355 degrees
2 m ambient temperature	RTD	Vaisala	HMP35C	NA	-35 - 50 °C
2 m relative humidity	Solid State	Vaisala	HMP35C	NA	0 - 100%
Data Logging	Digital	CSI	CR10	NA	NA

Comments: Primary audit was on the sodar. Some radar profiler information is provided.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored. Also measured are 10 m winds using a sonic anemometer. The orientation of the sonic was verified to be within ±2° of true.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Gateway computer and monitor	NA	NA	NA	NA
UPS	NA	NA	NA	NA

Comments: The gateway computer system is running in a Windows 95 environment.

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments: Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (applies to both the sodar and radar mounted on the same trailer)	Antenna trailer – 1° 10 m Vane – 7° Sonic anem. – 2°	Yes No Yes
2. Level (applies to both the sodar and radar mounted on the same trailer)	<0.3°	Yes
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	5 m	See below

Comments: 1. The orientation of the wind vane was outside of audit criteria. The orientation was corrected during the audit.

4. There are several sources of noise that could affect the sodar operation. The most significant is an air conditioner on the adjacent trailer (about 5 meters from the sodar antenna. One sodar beam was toward the air conditioner. The broad band noise in the direction of the air conditioner averaged about 60 dBA, as opposed to 52 to 54 dBA in the other potential beam directions. A sampling of the spectral noise in the direction of the air conditioner showed active noise around the sodar operational frequency (the sodar frequency is 1889 Hz). Most significant was a band at about 1900 Hz. A quick review of the on-site data showed the sodar is seriously affected by the noise in the wind levels above about 250 to 300 meters. Aiming the beam away from the air conditioner may not help the problem because the interference is also seen in the vertical beam. The noise from the air conditioner needs to be minimized in order to achieve reasonable data in the upper ranges of the sodar. Another possibility is to move the operating frequency to about 2400 Hz where the air conditioning frequency spectra was a minimum. However, the best alternative is to separate the noise source from the sodar.

Other active noise sources that could affect the sodar include broad band noise from the aircraft and helicopter operations at the airport and agricultural operations in the adjacent fields. These sources would tend to decrease the altitude capabilities of the sodar.

No significant active noise sources were observed in the radar operational frequency of 915 MHz.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	NA	Yes
3. Is separation at least 10x obst. height?	NA	NA
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	360°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	NA	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	NA	Yes
11. Are the distances 4x the obst. height?	NA	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes	See below
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 1. The radar was just changed from 924 MHz to 915 MHz to move away from interfering frequencies in the 924 MHz band.

5. Did not move equipment from rack to get serial numbers.

8. The site is visited approximately every two to four weeks for routine maintenance. There is a potential for problems to occur that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP. Additionally, more frequent checks of the surface meteorological equipment are needed. No log book entries were made regarding any checks performed. Included in the site maintenance should be more frequent cleaning of the surface sensors. The site is adjacent to agricultural operations that generate significant amounts of dust.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	Sodar – Echosonde 3.0.33 Radar – POP4	Yes Yes
2. Pulse length (sodar)	250 ms	Yes
3. High mode pulse length (radar)	700 ns	Yes
4. Low mode pulse length (radar)	400 ns	Yes
5. RASS pulse length	400 ns	Yes
6. Time zone	GMT	Yes
7. Wind data consensus	55 min	Yes
8. RASS consensus	3.5 min	See below

Comments: 8. The RASS was using about a 3.5 minute consensus average, with the other 1.5 minutes used in data transfer. Unlike the other systems in the network, the current software in the radar profiler allows selection of either a 5 minute or 10 minute period for the RASS, with no interim periods available (7 minute is desired). The radar manufacturer should be contacted to determine how a 7 minute period can be selected. This will allow consistency among the systems in the network.

	Wind Low Mode	Wind High Mode	RASS	Sodar
First Gate	110 m	144 m	135 m	50
Last Gate	2144 m	3704 m	1635 m	710
Spacing	55 m	96 m	60 m	20 m
Full Scale Velocity	10.2	10.4	NA	NA

Comments:

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	See below	See below
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	No	No
7. Is the site secure?	See below	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 2, 3. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

4. As indicated above, more frequent cleaning of the instruments is needed to remove dust from the adjacent agricultural operations.

6. While there is a dial up line at the site there is no phone. Adding a phone is recommended.

7. Security is good. However, there are no signs warning of potential radio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	No	No
3. Do station logs contain details as required by the SOPs?	No	No
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	No	No
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	No	No
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	See below	No
12. Has the site technician undergone training as specified in the SOPs?	See Below	No
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	NA	See below

Comments: 2, 3, 5, 11. Minimal checks of the surface meteorological instrumentation had been performed since the initial setup. Logs were filled out for the sodar and radar wind profiler and RASS, but none for the surface sensors. The initial log sheet did not have a site name, date, operator or time information. Better record keeping and more consistent site checks are recommended. Part of the problem comes from different operators at the site with their own equipment. Checks were generally done on the that equipment that was considered in their own "group".

6. Calibration records are maintained at NOAA/ETL

8. The engineer at the site (Brian) was not aware of SOPs for the surface equipment. SOPs should be provided to Brian to aid him in the checks performed when he is at the site.

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance. The engineer at the site (Brian) had not been trained on the checks needed for the

surface meteorological instrumentation. Furthermore, he was unaware he was to do the checks during his visits to maintain the sodar and radar instrumentation.

13, 14. The site is visited approximately every two to four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or trailer movement that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every two to four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drives with CDF files downloaded on a daily basis.
3. How often are the data backed up?	Files are copied from the system computers to the gateway with consensus files downloaded hourly. Moments data are downloaded once per day.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	No	No
3. Are field operators given special training in preventive maintenance?	See below	NA
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 2, 3. Preventive maintenance was lacking due to the confusion in responsibilities for checking the surface sensors.

4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	See below	See below
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	See below	See below
4. Does the QC program appear to be working?	See below	See below
5. Overall, does the meteorological data look reasonable?	See below	See below
6. Overall, does the data appear to meet the program objectives?	See below	See below

Comments: 1, 3, 4. As indicated previously, preventive maintenance needs improvement with appropriate training and assignment of responsibilities. The QC program is just becoming implemented.

5. Daytime sodar data looks reasonable. However, a quick comparison between the sodar and radar wind profiler data showed what appeared to be higher magnitude speeds in the sodar data, while the general wind directions looked reasonable. A further evaluation of the sodar data showed what appeared to be higher than expected vertical velocities in the upper levels. For example, at 1000 GMT (0300 PDT) on July 17, vertical velocities of greater than 1 m/s at about 300 meters were observed. This is not reasonable for nighttime hours. Subsequent hours showed similar patterns. A review of two other days showed similar patterns with higher than expected vertical velocities starting at around 300 meters. It is suspected that the fixed frequency rejection algorithms are not working on the potential noise generated by the shelter air conditioner. There is enough mixing of the A/C noise and ambient signals that an apparent peak is picked that is not truly representative of the atmospheric echoes. The fact that it is seen in the vertical antenna, and all data is vertical velocity corrected, means all data will be affected, regardless of the beam directions.

It is recommended a further review of the data should be performed to confirm the interference problem and consideration given to either moving the shelter further away from the antennas or placing a barrier between the air conditioner and the antennas to minimize the noise interference.

The header information in the sodar data is incorrect. It lists the site information for the BAO tower. The proper information should be entered into the header.

6. The radar data were not reviewed as part of this audit. The data should be reviewed and comparisons made to the sodar data once the sodar noise contamination problem is resolved.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Los Alamitos	Instrument:	NOAA ETL RWP/Sodar
Date:	July 16, 1997	Receiver s/n:	NA
Time:	1000 PDT	Interface s/n:	NA
Measurements group:	NOAA/ETL	Firmware version:	Radar – POP 4 Sodar – NA
Key contact:	Brian Templeman	System ant. Orientation:	182°, 272°
Audited by:	Bob Baxter	Measured orientation:	181°, 271°
Site longitude:	118° 03.01' W	Orientation difference:	1°, 1°
Site latitude:	33° 47.31' N	Antenna level diff.:	< 0.3°
Site elevation:	NA	Horizontal beam angle:	14.87°
Magnetic declination:	15° (appx)	Beam directions:	182°, 272° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
0	15	2	Warehouse building outside base at ~2.5 km.
30	45	3	Office building outside base at ~3 km.
60	75	3	Trees in golf course at ~800 m.
90	105	3	Trees in golf course at ~800 m.
120	135	2	Small building with trees behind it at ~1 km
150	165	4	Trees in golf course at ~1 km.
180	195	14	Radar unit at about 30 m.
210	225	2	Trees outside base at ~3 km.
240	255	<2	Runway at ~ 300 m, trees at ~3 km.
270	285	<2	Runway at ~150 m, houses at ~3 km.
300	315	<2	Runway at ~125 m, aircraft hangar at ~1.5 km.
330	345	<2	Runway at ~75 m, long utility building at ~1 km.

Comments: The sodar, radar wind profiler and RASS were all mounted on the same trailer. The sodar acts as the RASS source during the RASS operations. The indicated levels are for the sodar and apply to the radar. The sodar was the primary instrument audited.

SCOS97-NARSTO AUDIT RECORD
AMBIENT NOISE

Site Name:	Los Alamitos	Meter Manufacturer:	Realistic
Date:	July 16, 1997	Model Number:	33-2055
Time:	1855 PDT	Averaging:	Slow
Measurements group:	NOAA/ETL	Weighting Scale:	A
Key contact:	Brian Templeman	Time Averaging (sec):	60
Audited by:	Bob Baxter	Meter Range (dB)	50 - 70

Mag. Az. Angle (deg)	True Az. Angle (deg)	Noise Min (dB)	Noise Max (dB)	Noise Avg (dB)	Comments
NA	0	<50	65	52	Toward runway, can hear aircraft.
NA	90	<50	69	54	
NA	180	52	>70	60	Primary noise is from the air conditioner on top of the adjacent equipment trailer. There was also some noise from overhead aircraft.
NA	270	50	64	53	Can hear traffic from a nearby highway.

"Listen Only" Results: Response showed no active noise sources in sodar spectrum during the period of the "listen only" test.

Comments: There are several sources of noise that could affect the sodar operation. The most significant is an air conditioner on the adjacent trailer (about 5 meters from the sodar antenna. One sodar beam was aimed into the air conditioner. A sampling of the spectral noise in the direction of the air conditioner showed active noise around the sodar operational frequency (the sodar frequency is 1889 Hz). Most significant was a band at about 1900 Hz. A quick review of the on-site data showed the sodar is seriously affected by the noise in the wind levels above about 250 to 300 meters. Aiming the beam away from the air conditioner may not help the problem because the interference is also seen in the vertical beam. The noise from the air conditioner needs to be minimized in order to achieve reasonable data in the upper ranges of the sodar. Another possibility is to move the operating frequency to about 2400 Hz where the air conditioning frequency spectra was a minimum. However, the best alternative is to separate the noise source from the sodar.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: July 16, 1997
Start: 1410 PDT
Finish: 1430 PDT
Auditor: Bob Baxter

Site name: Los Alamitos (LAS)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Brian Templeman

Sensor Mfg: R.M. Young
Sensor s/n: NA
K factor: 2.4
Range: 0 - 50 m/s
Logger: CSI CR10
Logger s/n: NA
Prop s/n: 46729

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.2 gm-cm
Starting Threshold: 0.29 m/s

Last calibration date: unknown

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.1	0.1	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	12.3	#N/A	#N/A	12.2	-0.1	-0.8
5	22.1	#N/A	#N/A	22.0	-0.1	-0.5
6	34.3	#N/A	#N/A	34.3	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: The nose cone was removed to perform the torque tests.
Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: July 16, 1997
Start: 1230 PDT
Finish: 1250 PDT
Auditor: Bob Baxter

Site name: Los Alamitos (LAS)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Brian Templeman

Sensor Mfg: R.M. Young
Serial No.: NA
K Factor: NA
Range: 0 - 355 deg
Logger: CSI CR10
Logger s/n: NA

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: M/S

Last calibration date: unknown

Box: 174.5 deg true

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	174.5				181.5		7.0
1	120	113.8	#N/A	#N/A	120.8	0.0	7.0
2	180	173.8	#N/A	#N/A	180.8	0.0	7.0
3	240	233.8	#N/A	#N/A	241.8	1.0	8.0
4	300	293.8	#N/A	#N/A	299.8	-1.0	6.0

Avg difference:		7.0
Maximum difference:	-1.0	8.0

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor orientation was off by 7° and failed criteria.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.
Note the "Corrected Degrees Reference" includes the offset for the arbitrary markings on the sensor shaft.
Not all of the directions could be tested because of the position

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: July 16, 1997
Start: 1505 PDT
Finish: 1506 PDT
Auditor: Bob Baxter

Site name: Los Alamitos (
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Brian Templema

Sensor Mfg: Vaisala
Serial No.: NA
Range: -35 - 50 Deg C

Model: HMP35C
Sensor Ht.: 2 m

Logger: CSI CR10
Logger s/n: NA

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	26.5	#N/A	#N/A	26.6	0.1

Criteria: +/- 0.5 degree Celsius

Comments: The sensor could not be immersed in water. When placed in a water proof sheath, there was not enough heat transfer to perform the audit. A single point comparison was performed which showed acceptable results.

Las

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: July 16, 1997
Start: 1145 PDT
Finish: 1159 PDT
Auditor: Bob Baxter

Site name: Los Alamitos (LAS)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Brian Templeman

Sensor Mfg: Vaisala
Serial No.: NA
Range: 0 - 100 Percent

Model: HMP35C
Sensor Ht.: 2 m

Logger: CSI CR10
Logger s/n: NA

Last calibration date: unknown

	Cal. Factors	
	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	58.5	17.7	#N/A	#N/A	#N/A	57.7	17.5	-0.2

Criteria: +/- 1.5 degree Celsius

Comments: Sensor passed.

SCOS97-NARSTO AUDIT RECORD
APT -- DOPPLER SODAR

Date: 7/16/97
Start: 1615 PDT
Finish: 1715 PDT
Auditor: Bob Baxter

Sensor Mfg: NOAA/ETL
Serial No.: NA
Sodar software ver.: 3.0.33
Range: 50 - 790 m w/20 m gates
Avg. Int.: 60 minute (15 min used in the audit)
Antenna angles: 182°, 272°
Transp. mode: Continuous tone, two frequency wind shear
APT software ver.: 1.06

Site name: Los Alamitos
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Brian Templeman

Model: 600 PA
Frequency: 1889 Hz
Measured antenna angles: 181°, 271°
Zenith angle: 14.87°
Mag. Declination: NA
Last cal. date: NA
APT File: 07161204.APT
Array level: Better than ±0.3°

		Horizontal												Vertical		
		APT Input		Sodar Output		Radial Diff.		APT Res In		Sodar Res Out		Result. Diff.		Audit	Sodar	
Time (PDT)	Level	Bm 1 (m/s)	Bm 2 (m/s)	Bm 1 (m/s)	Bm 2 (m/s)	Bm 1 (m/s)	Bm 2 (m/s)	Speed (m/s)	Dir (deg)	Speed (m/s)	Dir (deg)	Speed (m/s)	Dir (deg)	Input (m/s)	Output (m/s)	Diff (m/s)
1615 to 1630	1	0.12	0.12	0.19	0.16	0.07	0.04	0.17	226	0.23	229	0.06	3	-1.01	-1.09	-0.08
	2	-0.23	-0.23	-0.22	-0.22	0.01	0.01	0.33	46	0.31	47	-0.02	1	1.66	1.73	0.07
1700 to 1715	1	0.12	0.12	0.23	0.21	0.11	0.09	0.17	226	0.32	228	0.15	2	-1.01	-1.07	-0.06
	2	-0.23	-0.23	-0.24	-0.22	-0.01	0.01	0.30	46	0.31	47	0.01	1	1.66	1.73	0.07
Avg Difference (level 1)						0.09	0.07					0.11	3			-0.07
Avg Difference (level 2)						0.00	0.01					-0.01	1			0.07
Max Difference (level 1)						0.11	0.09					0.15	3			-0.08
Max Difference (level 2)						-0.01	0.01					-0.02	1			0.07

Audit Criteria (component): ±0.2 m/s
Audit Criteria (resultant): ±0.5 m/s, ±5°
Audit Criteria (alt. transition): ±1 range gate (20 m)

APT information

Transponding pulse length (ms):	Cont.
Transponder delay from pulse detection (ms):	0
Number of reporting altitudes:	2
Anticipated horiz. reporting alt. for transition level 1 (m):	329
Anticipated horiz. reporting alt. for transition level 2 (m):	657
Anticipated vert. reporting alt. for transition level 1 (m):	340
Anticipated vert. reporting alt. for transition level 2 (m):	680
Sodar transmit frequency (Hz):	1889
Assumed speed of sound (m/s):	340

APT Frequency Delay (ms)	APT Transponding Frequency (Hz)	Analysis Levels (m) Horiz.	Vert.	Measured Trans. (m) Horiz.	Vert.
2000	U, V, W = 1900.1	150-250	150-270	250	290
4000	U, V, W = 1870.4	450-610	450-630	610	650

Comments

The simulated signal provided by the APT gives a 180° wind shift through a layer. Consistent winds above and below this layer then tested the ability of the sodar to calculate the appropriate wind speeds and directions. The "transition layer" occurred over a period of 700 ms.

The sodar uses a 250 ms pulse and a fine range gate sampling of 20 meters. This will result in oversampling that will tend to smooth profiles. This should not be considered a problem since the longer pulse will help achieve a higher altitude capability.

Results of the performance audit showed the sodar responded outside criteria for the timing and altitude calculations. This is most likely due to the selected long pulse length and small sampling gates. The potential resulting data may get smoothed resulting in the observed differences. The fact that the upper range is within 30 to 50 meters shows the sodar timing is appropriate. The failure of the criteria is therefore not a problem.

The data shown were collected in the vertical velocity correcting mode with equal responding frequencies for each of the radial components. This resulted in relatively high vertical components and correspondingly low horizontal components once the vertical correction was made. Before correction for vertical velocity, the simulated components were 3.93 and -6.49 m/s for the lower and upper levels, respectively. The sodar was operated in the non-vertical correcting mode to observe those data calculations. The results were not stored in the database. The resultant values are shown below and are within the resultant audit criteria.

Time (PDT)	Level	APT In Speed (m/s)	APT In Dir (deg)	Sodar Out Speed (m/s)	Sodar Out Dir (deg)	Diff Speed (m/s)	Diff Dir (deg)
1615 to 1630	Lower	5.6	226	6.1	228	0.5	2
	Upper	9.2	46	9.5	47	0.3	1

RWP VS. RADAR

RWP	7/16/97 1040PDT			7/16/97 1735PDT		
RADAR	JD 197 17:00 GMT			JD 198 0:00 GMT		
		Average	**Std. Dev.**	**Average**	**Std. Dev.**	
	Temp Diff.	1.07	0.74	-1.52	0.56	
Hi-Mode	WS Diff.	-1.16	2.36	-0.10	1.07	
	WD Diff.	1.18	54.95	1.54	19.85	
Low-Mode	WS Diff.	-1.16	2.41	0.09	1.08	
	WD Diff.	3.46	85.24	10.26	27.24	

RWP	7/16/97 1040PDT			7/16/97 1735PDT		
RADAR	JD 197 16:00 GMT			JD 198 0:00 GMT		
		Average	**Std. Dev.**	**Average**	**Std. Dev.**	
	Temp Diff.	1.38	1.04	-1.52	0.56	
Hi-Mode	WS Diff.	-1.18	2.03	-0.10	1.07	
	WD Diff.	-11.90	87.95	1.54	19.85	
Low-Mode	WS Diff.	-2.15	2.52	0.09	1.08	
	WD Diff.	-0.64	70.94	10.26	27.24	

RWP	7/16/97 1040PDT			7/16/97 1735PDT		
RADAR	JD 197 18:00 GMT			JD 198 1:00 GMT		
		Average	**Std. Dev.**	**Average**	**Std. Dev.**	
	Temp Diff.	-0.08	1.34	-0.85	0.64	
Hi-Mode	WS Diff.	-0.40	1.81	0.73	1.76	
	WD Diff.	-1.55	56.88	-11.56	36.34	
Low-Mode	WS Diff.	-1.91	5.36	-0.29	1.99	
	WD Diff.	27.36	66.35	33.65	35.13	

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Los Alamitos
Date: July 16-17, 1997
Measurements Group: NOAA
Radar Profiler: NOAA
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	0.8
Maximum:	7.8
Minimum:	-1.7
Standard Deviation:	2.2
Root Mean Square:	2.3

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	2
Maximum:	67
Minimum:	-99
Standard Deviation:	25
Root Mean Square:	25

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	0.7
Maximum:	6.8
Minimum:	-2.6
Standard Deviation:	2.2
Root Mean Square:	2.3

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-17
Maximum:	77
Minimum:	-167
Standard Deviation:	44
Root Mean Square:	47

WS Difference (m/s)		
	7/16/97	7/16/97
Altitude	1040	1737
144		
241		-1.5
337	-1.7	-1.1
433	-0.9	-0.4
529		-0.4
625		-1.0
722		-1.4
818		-1.3
914		0.0
1010	-1.3	0.0
1106	1.3	-0.7
1203		-0.2
1299		0.9
1395		-0.6
1491	0.9	-0.1
1587	1.5	-0.5
1684	3.0	0.6
1780	2.5	1.0
1876	3.4	1.4
1972	4.8	2.6
2069	6.1	2.0
2165	7.8	
2261	5.8	
2357	4.9	
2453	1.1	
2550	0.5	
2646	1.0	
2742	-0.1	
2838	-0.7	
2934	-0.3	
3031	0.4	
3127	-0.5	
3223	0.1	
3319	1.3	
3415	1.5	
3512	-1.1	
3608	-0.9	
Average:	1.5	0.0
Maximum:	7.8	2.6
Minimum:	-1.7	-1.5
Std Dev:	2.5	1.1
RMS:	2.9	1.1

WD Difference (deg)		
	7/16/97	7/16/97
Altitude	1040	1737
144		
241		-40
337	67	-17
433	59	-24
529		-4
625		-7
722		-22
818		-20
914		5
1010	-99	14
1106	-44	17
1203		16
1299		5
1395		-17
1491	-9	0
1587	-2	13
1684	2	24
1780	0	8
1876	-13	19
1972	-2	36
2069	7	37
2165	-1	
2261	0	
2357	8	
2453	16	
2550	14	
2646	6	
2742	6	
2838	4	
2934	1	
3031	1	
3127	5	
3223	2	
3319	3	
3415	7	
3512	0	
3608	-1	
Average:	1	2
Maximum:	67	37
Minimum:	-99	-40
Std Dev:	28	21
RMS:	28	20

WS Difference (m/s)		
	7/16/97	7/16/97
Altitude	1040	1737
110		
165		0.0
220		-0.9
275	-2.1	-1.4
330	-2.6	-1.2
385	-2.0	-0.6
440		-0.1
495	-1.1	
550		-0.6
605		-0.8
660		-0.7
715		-1.3
770		-1.1
825		-0.4
880		-0.5
935		0.2
990	-1.2	0.3
1045	-1.2	-1.0
1100	0.9	-0.2
1155		-0.1
1210		
1264		
1319		
1374		
1429		-0.2
1484	0.4	0.1
1539	0.9	-0.4
1594	2.7	-0.2
1649	3.9	1.1
1704	5.2	
1759	2.2	3.2
1814	2.5	1.0
1869	2.9	0.8
1924	4.0	3.0
1979	4.7	
2034	5.7	
2089	6.8	
Average:	2.4	-0.1
Maximum:	6.8	3.2
Minimum:	-1.2	-1.4
Std Dev:	2.5	1.1
RMS:	3.5	1.1

WD Difference (deg)		
	7/16/97	7/16/97
Altitude	1040	1737
110		
165		-69
220		-73
275	-167	-47
330	-164	-25
385	11	-25
440		-31
495	77	
550		-11
605		-12
660		-20
715		-27
770		-28
825		-18
880		1
935		13
990	-93	12
1045	-86	12
1100	-33	20
1155		5
1210		
1264		
1319		
1374		
1429		-30
1484	4	-3
1539	3	2
1594	-23	37
1649	-26	4
1704	-14	
1759	4	19
1814	-13	16
1869	-10	19
1924	-12	25
1979	-3	
2034	9	
2089	7	
Average:	-28	-9
Maximum:	77	37
Minimum:	-167	-73
Std Dev:	60	28
RMS:	65	28

Comments:

1. RWP data was not available during the 7/29/97 10:00 AM sounding.
2. The low mode RWP first range gate reading does not correlate well with the data for the rest of the sounding. It appears that this point should have been invalidated during the data validation process.

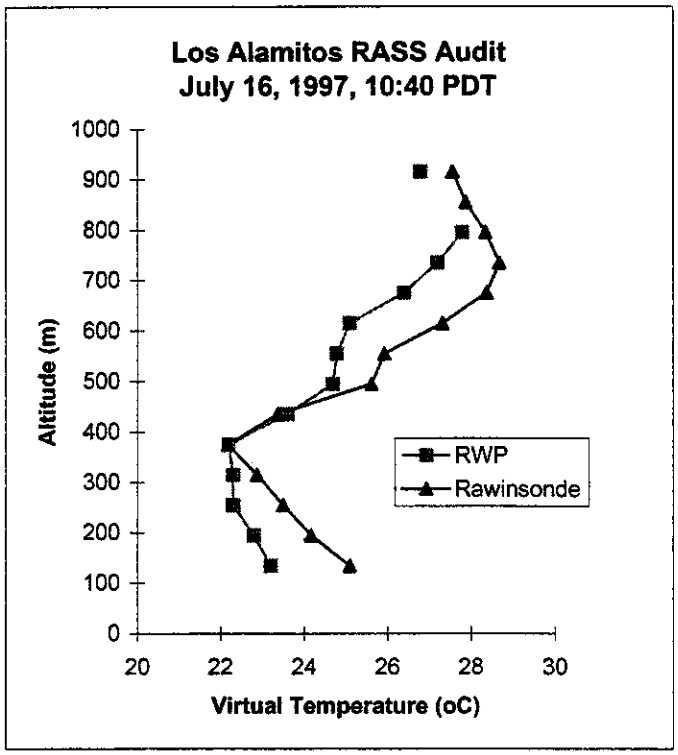
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/16/97
Start: 10:40 PDT
End: 10:50 PDT
Key Person: Brian Templeton
Auditor: Bob Baxter

Site Name: Los Alamitos
Project: Upper-Air Audit
Measurement Org.: NOAA

Instrument: NOAA

RASS Alt (m)	RASS Tv (oC)	Rawin Tv (oC)	Diff. (oC)
915	26.8	27.6	-0.8
855		27.9	NA
795	27.8	28.4	-0.6
735	27.2	28.7	-1.5
675	26.4	28.4	-2.0
615	25.1	27.3	-2.2
555	24.8	25.9	-1.1
495	24.7	25.6	-0.9
435	23.6	23.4	0.2
375	22.2	22.2	0.0
315	22.3	22.9	-0.6
255	22.3	23.5	-1.2
195	22.8	24.2	-1.4
135	23.2	25.1	-1.9



Results Summary

Average Difference:	-1.1
Standard Deviation:	0.7
Maximum Difference:	0.2
Minimum Difference:	-2.2

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535574
Td offset (oC):	0.9
RH offset (%)	3.0
Sonde Pressure (mb):	1013.9
Ref Pressure (mb):	1013.3
Difference (mb):	0.6

Comments:

1. The sonde data was vertically averaged to match the RASS levels.
2. The sonde Td and Tw offsets were included in the Tv calculations.
3. The rawinsonde PTH data stream stopped collecting data between 486 and 1485 meters.

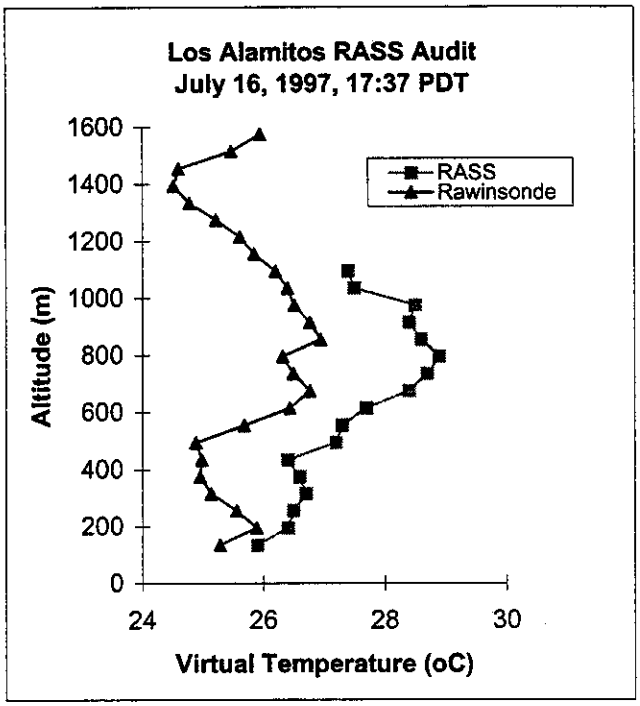
SCOS97-NARSTO Audit Report
RASS - Rawinsonde Virtual Temperature Comparison

Date: 7/16/97
Start: 17:37 PDT
End: 17:50 PDT
Key Person: Brian Templeton
Auditor: Bob Baxter

Site Name: Los Alamitos
Project: Upper-Air Audit
Measurement Org.: NOAA

Instrument: NOAA

RASS Alt (m)	RASS Tv (oC)	Rawin Tv (oC)	Diff. (oC)
1575		26.0	NA
1515		25.5	NA
1455		24.6	NA
1395		24.5	NA
1335		24.8	NA
1275		25.2	NA
1215		25.6	NA
1155		25.9	NA
1095	27.4	26.2	1.2
1035	27.5	26.4	1.1
975	28.5	26.5	2.0
915	28.4	26.8	1.6
855	28.6	26.9	1.7
795	28.9	26.3	2.6
735	28.7	26.5	2.2
675	28.4	26.8	1.6
615	27.7	26.4	1.3
555	27.3	25.7	1.6
495	27.2	24.9	2.3
435	26.4	25.0	1.4
375	26.6	25.0	1.7
315	26.7	25.1	1.6
255	26.5	25.6	0.9
195	26.4	25.9	0.5
135	25.9	25.3	0.6



Audit Sonde Data
Sonde Serial # : 1535662

Td offset (oC): 1.4
RH offset (%) 4.0

Sonde Pressure (mb): 1012.2
Ref Pressure (mb): 1011.8
Difference (mb): 0.4

Results Summary

Average Difference:	1.5
Standard Deviation:	0.6
Maximum Difference:	2.6
Minimum Difference:	0.5

Audit Criteria: +/- 1oC

Comments:

1. The sonde data was vertically averaged to match the RASS levels.
2. The sonde Td and Tw offsets were included in the Tv calculations.
3. The rawinsonde PTH data stream stopped collecting data between 486 and 1485 meters.

LOS ANGELES INTERNATIONAL AIRPORT (LAX)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Los Angeles International Airport (LAX)
Audit Dates:	June 26, 1997 - July 11, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Kevin Durkee
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems with the audit equipment occurred during the audit.

SITE CHARACTERISTICS

The site is located on a hill that over looks, on the east, the west end of the Los Angeles International Airport runways, and on the west, the Pacific Ocean. The hill is approximately 50 meters high. The actual RWP/RASS site is on the highest point of the hill, so there are no physical obstructions to the RWP and RASS antenna exposures.

SYSTEM AUDIT NOTES

1. The orientation of the RWP antenna was set to 307° , the audit measured the orientation at 309°. The operator decided to leave the set up as is.
2. The level of the northeast RASS acoustic sources exceeded the EPA PAMS recommended criteria of ± 1.0°. The level of this acoustic source antenna was adjusted following the audit. It is recommended that SCAQMD purchase a digital level to use in the antenna setups. It was previously found that ½ bubble, for the liquid filled levels, is equivalent to more than 2%.

3. The height of the surface wind sensors is 23 feet above ground level due to restriction placed on siting by the airport. These measurements will not be representative of the 10 meter flow and it will be influenced by the equipment trailer since the height of the sensors is not 1.5 times the height of the trailer above the trailer roof.
4. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
5. The wind direction sensor was rotated 9° from true north. The sensor orientation was corrected following the audit. No further action is required.

POTENTIAL ACTIVE NOISE SOURCES

No RFI was detected from a scan of the frequencies between 914 and 916 mHz, and a listen only check.

POTENTIAL PASSIVE NOISE SOURCES

No passive sources were noted. The north antenna data did not indicate clutter from the hill to the east-northeast of the site.

ANTENNA LEVEL AND ALIGNMENT

1. The RWP pointing angle was set to 307°. The audit determined pointing direction was 309°, a difference of -2°.
2. The level of all of the northwest RASS acoustic source antenna was outside of the EPA PAMS criteria of ±1.0°.

RADAR PROFILER PERFORMANCE AUDIT

– **RWP – RAWINSONDE COMPARISON**

The results of the comparison between the audit rawinsonde wind data with the radar profiler winds were as follows:

	Low Mode		High Mode	
	Wind Direction (deg)	Wind Speed (m/s)	Wind Direction (deg)	Wind Speed (m/s)
Average Difference	21	-3.2	-9	-2.4
Standard Deviation	55	3.5	86	3.2
Root Mean Squared	58	4.7	86	4.0

Criteria: ± 10° - wind direction
± 1.0 m/s - wind speed.

The reason(s) for the differences in the wind speed and direction average differences that exceeds the audit criteria is not clear, although the comparisons for the afternoon sounding as compared with the morning and evening sounding is better. This may be a result of there being higher wind speeds which tends to produce less variation between the two measurement systems. These differences will have to be resolved by the sodar and radar profiler wind comparisons.

– RWP – AUDIT SODAR COMPARISON

The results of the comparison between the audit sodar wind data with the radar profiler winds were as follows:

	Low Mode		High Mode	
	Wind Direction (deg)	Wind Speed (m/s)	Wind Direction (deg)	Wind Speed (m/s)
Average Difference	7	-1.4	-8	-1.4
Root Mean Squared	42	1.8	48	1.8

Criteria: ± 10° - wind direction
± 1.0 m/s - wind speed.

The reason(s) for the differences in the wind speed average differences that exceeds the audit criteria is not clear, most likely it was due to the quality of the audit sodar data. The LAX site was located at the end of the active runways. Departing aircraft made a lot of noise which apparently interfered with the sodar data collection.

RASS PERFORMANCE AUDIT

The comparison of the RASS virtual temperature profiles with virtual temperature profiles calculated from rawinsonde data revealed the following:

1. RASS data was not generally available above 1,200 meters
2. The RASS tends to overestimate the heights of the inversions.
3. The RASS tends to underestimate the strength of inversions, and the RASS data appears smoothed as compared with the rawinsonde data.
4. Tv differences below 1,200 meters are greater than above this height with the rawinsonde Tv values higher than RASS values. These differences tend to decrease at higher altitudes. The reason for this may be due to the rawinsondes being released at the east end of the airport and the RASS being located on the hill over looking the ocean to the west of the airport runways. Temperatures at ground level at the RASS site would be lower due to the proximity to the ocean and the natural dirt ground cover versus the cement and asphalt environment at the rawinsonde launch site.

RADAR PROFILER DATA INTERNALCONSISTENCY

1. Overall, the data look reasonable. A review of the data collected during the period of the audit, showed the low mode data to able to gather data through the top of the sounding, while the high mode winds were restricted to below 2,000 to 2,500 meters. The data is comparable between the two modes of operation. The site operator reported that the lack of data in the upper layers of the high mode may be due to problems with the phase shifter.

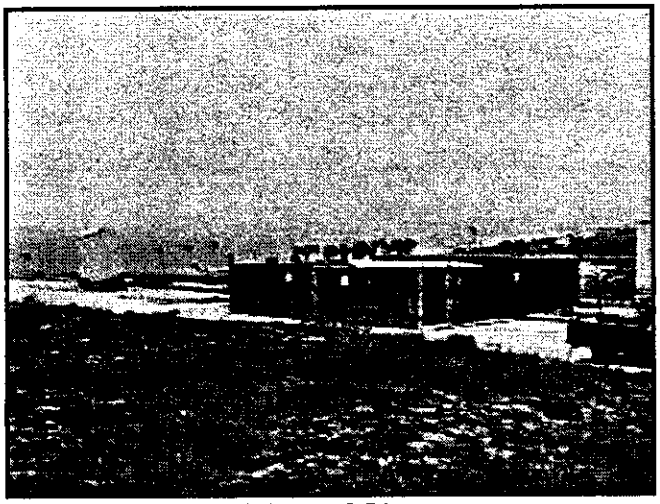
RASS DATA INTERNAL CONSISTENCY

1. Data collected just during the period did not reach above 1,000 meters very often. The data look reasonable for the area and times of day.

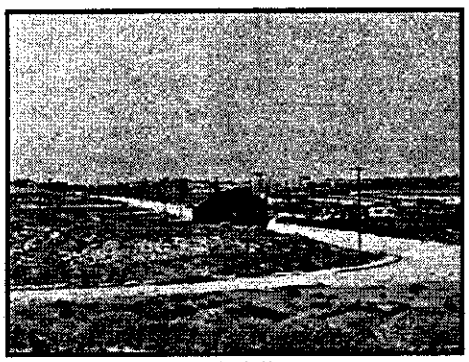
SURFACE METEOROLOGY PERFORMANCE AUDIT

1. The 10 meter wind direction sensor orientation was outside of criteria which produced a total error of 9°. The sensor was aligned following the audit and the alignment verified.
2. All sensors are scanned every 10 seconds with five minute averages recorded. Other than the wind direction alignment error, no problems were noted with the performance audit results. However, not all of the variables could be audited completely. A summary of these audits are provided below:
   - The temperature sensor could not be immersed in water and the probe design was not conducive to placement in a water proof sheath while retaining good thermal conductivity. Only one ambient comparison point was therefore audited.
   - Wind data recorded include scalar wind speed and resultant vector wind direction.
   - As indicated above, the 10 meter wind direction sensor orientation was outside of criteria which produced a total error of 9°. The sensor was aligned following the audit and the new alignment verified.

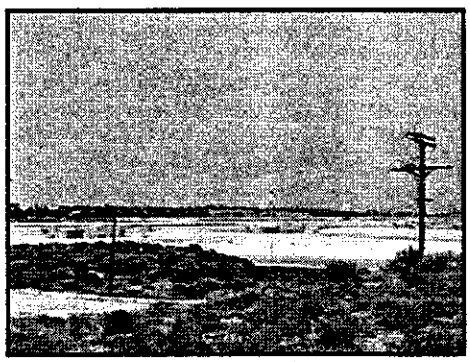
Los Angeles International Airport Site
Photographs



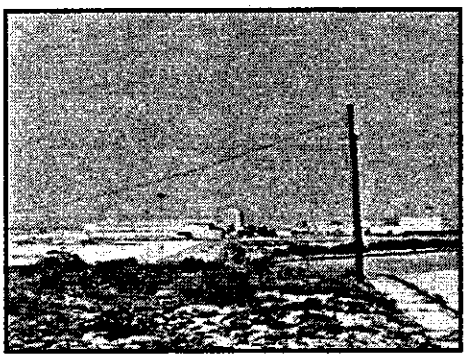
View of Site



North View



Northeast View

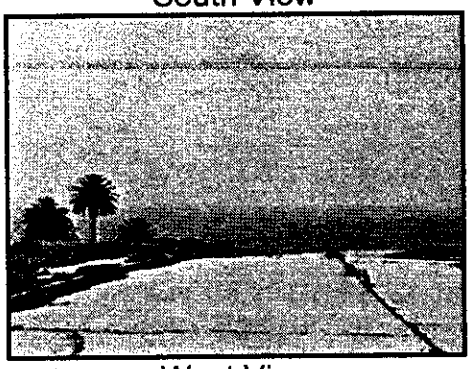


East View

Southeast View

South View

Southwest View



West View

Northwest View

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	SCAQMD
SITE NAME AND LOCATION:	Los Angeles International Airport (LAX)
AUDITOR:	Alex Barnett
DATE:	June 26, 1997 - July 11, 1997
KEY PERSON:	Kevin Durkee

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar profiler	Radian	LAP-3000	Rx/Tx: 5209 Interface: 5211	Lo 159-1503 m at 56 m inc. Hi 194-4017 m at 98 m inc.
Virtual Temperature	RASS	Radian	LAP-3000	Rx/Tx: 5209 Interface: 5211	167 - 1607 m at 60 m inc.
	Audio Amplifier	Peavey	CS-400X		
Wind Speed		Met One	1564D	2924	0 - 120 mps
Wind Dir.		Met One	1565D	2925	0 - 360°
Amb. Temp.		Met One	083C-1-35	2348	-50 to 50°C
Rel. Hum.		Met One	083C-1-35	2348	0 - 100%
	Data Logger	Met One	457	N7122	

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Audio amp.	Peavey	CS-400X		
Interface	Radian	LAP-3000	5211	
Receiver/Mod.	Radian	LAP-3000	5209	
Radar Comp.	IBM	486	270131094	
Gateway Comp	IBM	486-33		
Data logger	Met One	457-6853	N7122	

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Ear defenders	NA[1]	NA	NA	
Bubble level	NA	NA	NA	
Ladder	NA	NA	NA	

Comments:

1. Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler and RASS

Variable	Value	Meet SOP (Yes/No)
1. Orientation	307°	No
2. Level	NW-SE: 0.7° NE-SW: 0.6°	Yes Yes
3. Acoustic source level	SE: 0.9°, 0.5° NE: 0.4°, 2.6° NW: 0.4°, 0.9° SW: 0.5°, 0.4°	Yes No[3] Yes Yes
3. Distance to closest obstruction	None	Yes
4. Distance to closest active noise source	None[4]	Yes

Comments:

1. The the orientation of the RWP antenna differed from the audit determined orientation by -2°.
2. The 23 foot wind vane orientation was outside orientation criteria by 6°.
2. The northeast RASS acoustic source was out of level by 2.6°. The acoustic source was leveled following the audit.
4. A listen only test of the radar revealed no significant RF sources nearby.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	23'	Yes[1]
2. Distance to nearest obstacle	None	Yes
3. Is separation at least 10x obst. Height?	Yes	Yes
4. Are instruments on a rooftop?	Yes	Yes
5. Is exposure 1.5X height above the roof?	No	No[2]
6. Arc of unrestricted flow?	360°	Yes
7. Height of temp sensor above ground.	20'	Yes
8. Distance of temp sensor from obst.	None	yes
9. Hgt of Dew pt/RH sensor above ground.	20'	Yes
10. Distance Dew pt/RH sensor from obst.	None	Yes
11. Are the distances 4X from obst. Hgt.?	Yes	Yes
12. Is sensor shielded/motor asp?	No	Yes[3]
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the on site equipment and the monitoring plan?	No	Yes

Comments:

1. The airport imposed a height restriction on the wind sensors. The wind measurements therefore are not representative of 10 meter winds.
2. The tower is next to the instrument trailer, and is not 1.5x the height of the trailer above its roof. The wind measurements therefore will be influenced by the trailer's wake.
3. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS, and Surface Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	Yes	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

B. Radar Profiler Settings

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Software version?	POP-4 .23.03	Yes
2.	High mode wind pulse length?	700 ns	Yes
3.	Low mode wind pulse length?	400 ns	Yes
4.	RASS pulse lenght ?	400 ms	Yes
4.	Time zone	PST	No
5.	RASS acoustic temperature range ?	-1.9 to 31.98°C	Yes
6.	RASS acoustic source range ?	5.11 to 30.2°C	No
7.	Wind data consensus	55 minutes	Yes
8.	RASS consensus	5 minutes	Yes

Comments:

	Wind Low Mode	Wind High Mode	RASS

First Gate	0.12 km	0.16 km	0.12 km
Last Gate	1.56 km	4.25 km	1.56 km
Spacing	60.0 m	100.0 m	60.0 m
Full Scale Velocity	10.2 m/s	29.03 m/s	409.8 m/s

Comments:

C. Auxiliary Equipment

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	No[1]	See below
3.	Is the site temperature maintained at 20-30°C?	yes	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	yes
6.	Does the telephone work?	Yes	yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

1. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

C. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes[1]	Yes
2.	Are the station logs up to date?	Yes[1]	Yes
3.	Do station logs contain details as required by the SOPs?	Yes[1]	Yes
4.	Are routine checklists used?	Yes[1]	Yes
5.	Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6.	Are the calibration forms present?	Yes	Yes
7.	Do the calibration forms contain details as required by the SOPs?	Yes	Yes
8.	Are the SOPs present?	Yes	Yes
9.	Are the instrument manuals present?	Yes	Yes
10.	Do the SOPs include quality control tests?	Yes	Yes
11.	If quality control tests are included then how are the results of the tests documented?	On Maint. Sheet	Yes
12.	Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13.	Is the site visited twice weekly?	Twice monthly[2]	Yes
14.	Does the site technician understand the SOPs?	Yes	Yes

Comments:

1. The LAP-3000 Monthly Maintenance Sheet is used to record all checks performed and action taken.

D. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments: Okay.
2.	How are data stored?	Computer hard disk
3.	How often are the data backed up?	Hourly by Diamond Bar Office. Also backed up on tape drive every two weeks.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	NA[1]	
2.	Is preventive maintenance being performed?	Yes[2]	Yes
3.	Are field operators given special training in preventive maintenance?	Yes	Yes
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5.	Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

1. SOP not available at time of audit.
2. Should check level and orientation during each site visit.

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes[1]	Yes
2.	Does the siting meet the program objectives?	Yes	Yes
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?	Yes	Yes
6.	Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

1. Should check antenna level and orientation during each site visit.
2.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	LAX	Instrument:	LAP-3000
Date:	6/26/97 - 7/10/97	Receiver s/n:	5209
Time:		Interface s/n:	5211
Measurements group:	SCAQMD	Frimware version:	POP-4
Key contact:	Kevin Durkee	System rotation angle:	307° True
Audited by:	Alex Barnett	Measured orientation:	309° True
Site longitude:	118° 26.20'W	Orientation difference:	-2°
Site latitude:	33° 56.42'N	Array level:	NW-SE: 0.7°
			NE-SW: 0.6°
Site elevation:	47 meters	Beam zenith angle:	21°
Magnetic declination:	14°E	Beam directions:	217° and 307°

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	Empty lots and telephone poles below the level of the RWP and RASS.
NA	30	<2	Airport, below the level of the RWP and RASS.
NA	60	<2	Airport, below the level of the RWP and RASS.
NA	90	<2	Airport, below the level of the RWP and RASS.
NA	120	<2	Airport, below the level of the RWP and RASS.
NA	150	5	Small hill to 50 meters.
NA	180	5	Small hill to 50 meters.
NA	210	5	Small hill to 50 meters.
NA	240	<2	Pacific Ocean, below the level of the RWP and RASS.
NA	270	<2	Pacific Ocean, below the level of the RWP and RASS.
NA	300	<2	Pacific Ocean, below the level of the RWP and RASS.
NA	330	<2	Pacific Ocean, below the level of the RWP and RASS.

Comments:

AeroVironment Environmental Services Inc.
HORIZONTAL WIND SPEED

Date: 06/26/97
Start: 14:52 PDT
Finish: 15:00 PDT
Audited By: Alex Barnett
Witness: Kevin Durkee

Site Name: LAX
Operator: SCAQMD
Project: SCAQMD Upper Air

Manufacturer: Met One
Serial No.: 2924
K factor: 1.4
Range: 100 mph

Model: 1564D
Sensor Ht.: 23'
Starting torque: 0.2 gm cm
Starting threshold: 0.85 mph

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Last calibration date: 06/19/97 Int.:	0.000	0.000

WS Audit Point	MPH Input	MPH Chart	MPH Diff. Chart	MPH DAS	MPH Diff. DAS
1	0.60	#N/A	#N/A	0.00	-0.60
2	5.10	#N/A	#N/A	5.10	0.00

Audit Criteria: +/-.56 MPH; ws <= 11.2 MPH

Audit Point	MPH Input	MPH Chart	% Diff. Chart	MPH DAS	% Diff. DAS
3	11.90	#N/A	#N/A	11.90	0.0
4	23.20	#N/A	#N/A	23.20	0.0

Audit Criteria: +/- 5%; ws > 11.2 MPH

Comments: None

AeroVironment Environmental Services Inc.
HORIZONTAL WIND DIRECTION

Date:	06/26/97	Site Name:	LAX
Start:	15:00 PDT	Operator:	SCAQMD
Finish:	15:30 PDT	Project:	SCAQMD Upper Air
Audited By:	Alex Barnett		
Witness:	Kevin Durkee		

Manufacturer:	Met One	Model:	1565D
Serial No.:	2925	Sensor Ht.:	23'
K factor:	29.8	Starting torque:	5 gm cm
Range:	360 Deg	Starting threshold:	0.41 m/s
Crossarm:	2 Deg true		

		Chart	DAS
Last calibration date:	06/19/97	Slope:	1.000	1.000
		Int.:	0.0	0.0

WD Audit Point	Degrees Reference	Degrees Chart	Diff. Chart	Degrees DAS	Diff. DAS
1	92	#N/A	#N/A	97	5
2	182	#N/A	#N/A	187	5
3	272	#N/A	#N/A	282	10
4	362	#N/A	#N/A	369	7

Audit Criteria: +/- 5 degrees

Comments: None

AeroVironment Environmental Services Inc.
AMBIENT TEMPERATURE

Date: 06/26/97
Start: 15:30 PDT
Finish: 16:00 PDT
Audited By: Alex Barnett
Witness: Kevin Durkee

Site Name: LAX
Operator: SCAQMD
Project: SCAQMD Upper Air

Manufacturer: Met One
Serial No.: 2348
Lower Range: -50 Deg C
Upper Range: 50 Deg C

Model: 083C-1-35
Sensor Ht.: 20'

Last calibration date: 06/19/97

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	24.5	#N/A	#N/A	24.8	0.3

Audit Criteria: +/- 1.0 degree Celsius

Comments: None

AeroVironment Environmental Services Inc.
RELATIVE HUMIDITY

Date: 06/26/97
Start: 16:00 PDT
Finish: 16:10 PDT
Audited By: Alex Barnett
Witness: Kevin Durkee

Site Name: LAX
Operator: SCAQMD
Project: SCAQMD Upper Air

Manufacturer: Met One
Serial No.: 2348

Model: 083C-1-35
Sensor Ht.: 20'

Psychro. Units: Deg C

Last calibration date: 06/19/97

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.00	0.00

R.H. Audit Point	R.H. Input	R.H. Chart	R.H. Diff. Chart	R.H. DAS	R.H. Diff. DAS
1	59.2	30.0	-29.2	59.5	0.3

Audit Criteria: N/A

Equivalent Dew Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	16.0	5.8	-10.2	16.1	0.1

Audit Criteria: +/- 1.5 degrees Celsius

Comments: None

Radar Profiler - Sodar Wind Speed Comparison

Site: Los Angeles International Airport
Date: July 6 - 15, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Direction (m/s)
Average:	7
Maximum:	160
Minimum:	-133
Standard Deviation:	42
Root Mean Square (RMS):	42

	Wind Direction Difference (deg, RWP - Sodar) Range Gates (meters)										
	159	215	271	327	383	439	495	551	607	663	719	775
	-6	-19	-20	-31	-23	-45	-6	8	74	-110	-118	-115
	6	-12	2	-1	50	10	8	2	-64	-97	160	
		9	-21	36	-9	9	17	23	-47	-80		
		24	24	-19	-7	13	20	-85				
		9	21	44	48	37	106	104				
		-10	0	121	0	-133	39	53				
		-8	19	55	43	-36	10	-54				
		-1	-5	58	19	44	19					
		3	2	28	26	42	-7					
		-10	-4	-7	19	41	-56					
		6	14	7	-94	26	-55					
		-8	-1	4	3	14	-119					
		19	21	29	21	45	15					
		55	27	-52	8	17						
		-52	-43	15	46	-2						
		-19	8	-1	33	-30						
		18	21	50	20	-28						
		1	44	41	-1	1						
		39	34	55	19	16						
		12	-4	49	84	14						
		28	11	36	-5	22						
		21	10	0	2	-2						
		72	54	26	-9	16						
		-28	36	8	25	-72						
		22	37	21	22							
		18	24	37	25							
		23	26	-13	43							
		40	22	-2	23							
		16	-13	-9	-37							
		16	14	27	-2							
		-6	8	39	37							
		7	27	29	42							
		1	38	30	22							
		19	10	2	37							
		2	64	29	33							
		-4	77	4	10							
		18	-125	36	7							
		-1	21	29	-114							
		-30	-3	49								
		-23	-8	44								
		22	-65	33								
		-4	-59	16								
		50		6								
		50		-79								
		17		-133								
		-6										
		-5										
		-45										
		-37										
Average:	0	6	8	17	12	1	-1	7	-12	-96	21	-115
Std Dev:	8	25	35	39	36	41	54	63	75	15	197	#DIV/0!
RMS:	6	26	36	42	38	40	52	59	63	96	141	115
Maximum:	6	72	77	121	84	45	106	104	74	-80	160	-115
Minimum:	-6	-52	-125	-133	-114	-133	-119	-85	-64	-110	-118	-115

Radar Profiler - Sodar Wind Speed Comparison

Site: Los Angeles International Airport
Date: July 6 - 15, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.4
Maximum:	3.5
Minimum:	-4.4
Standard Deviation:	1.2
Root Mean Square (RMS):	1.8

	Wind Speed Difference (m/s, RWP - Sodar) Range Gates (meters)											
	159	215	271	327	383	439	495	551	607	663	719	775
	-1.4	-0.6	-0.8	-1.1	-0.4	-1.6	-1.6	0	0	-2.5	-1.4	-2.4
	-0.3	-1.9	-1.3	-1.9	-2.2	-3.2	-1.6	0.3	-1.3	-1.5	-1.9	
		-2	-1.2	-2.7	-1	-2.2	-1	0.1	-1.2	-1.8		
		-1.2	-1.9	-1.2	-1.3	-0.9	-2.3	-1.7				
		-0.7	-0.6	-1.3	-3	-0.7	-0.7	-2.8				
		-1.8	-1.5	-1.4	-1.9	-2	-3.1	-3				
		-1.7	-2.7	-0.8	-2.5	-1.6	-2.9	-2.8				
		-2.5	-2.3	-1.7	-3.5	-0.8	-3.4					
		-2.4	-1.2	-0.6	-4.4	-0.2	-3.4					
		-1.6	-1.7	-1.3	-2.3	-2.1	-3.6					
		-1.9	-3.3	-3.7	-1.8	-1.9	-2.3					
		-1.4	-2.1	-2.6	-1.7	-2.1	-2.8					
		-2	-2.6	-1.6	-1.2	-2.4	-1.4					
		-2.1	-1.4	-3.1	-1.4	-2						
		-2.4	-4.2	-2	-1	-0.9						
		-4.2	0.3	-2.1	-0.4	-2						
		-2.4	1.5	1.3	-0.8	-2.7						
		-1	0.7	0.4	-1.6	-2.3						
		-1.5	0	0.7	-1.6	-1						
		-1	-1.4	1.5	-1.6	-1.9						
		-0.4	-0.4	-0.2	-1.7	-1.5						
		1.3	0.6	-1.7	-1.7	-1.7						
		0.5	0	-0.8	-1.8	-2.4						
		-0.8	0.4	-1.3	-0.3	-1.4						
		-1.7	-1	-2.7	1.1							
		0.1	-0.5	-1.2	-0.7							
		0.5	-3.8	-1.6	-1.5							
		-1.7	-0.4	-1.6	-0.4							
		-0.4	-2.2	-2	-2.6							
		-3	-2.1	1.6	-0.6							
		-1.9	-2.1	1	-2.1							
		-0.4	2.4	0.9	-1.7							
		-1.3	1.6	2.2	-2							
		-1.9	-0.6	-2.2	-0.6							
		-1.6	-0.9	-1.2	0.6							
		-2.6	-0.5	-0.7	-2							
		-2.3	3.5	-0.8	-0.1							
		-3.2	-1.5	-1.7	-1.7							
		-1.3	-2.6	-0.3								
		-1.3	-2.4	0.8								
		-1.4	-2.7	1.1								
		-1.4	-2.8	-1.3								
		-1.8		-0.7								
		-0.2		-1.1								
		-1.1		-2.1								
		-1.9										
		-2.5										
		-1.7										
		-3.3										
Average:	-0.9	-1.5	-1.1	-1.0	-1.5	-1.7	-2.3	-1.4	-0.8	-1.9	-1.7	-2.4
Std Dev:	0.8	1.0	1.6	1.3	1.1	0.7	1.0	1.5	0.7	0.5	0.4	#DIV/0!
RMS:	1.0	1.8	1.9	1.6	1.8	1.9	2.5	2.0	1.0	2.0	1.7	2.4
Maximum:	-0.3	1.3	3.5	2.2	1.1	-0.2	-0.7	0.3	0.0	-1.5	-1.4	-2.4
Minimum:	-1.4	-4.2	-4.2	-3.7	-4.4	-3.2	-3.6	-3.0	-1.3	-2.5	-1.9	-2.4

Radar Profiler - Sodar Wind Speed Comparison

Site: Los Angeles International Airport
Date: July 6 - 15, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

High Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Direction (m/s)
Average:	-8
Maximum:	179
Minimum:	-143
Standard Deviation:	48
Root Mean Square (RMS):	48

	Wind Direction Difference (deg, RWP - Sodar) Range Gates (meters)						
	194	292	390	488	586	684	782
	57	-32	-22	-27	40	-115	-110
	7	-1	66	5	4	-93	
	3	-24	-39	2	21	179	
	3	32	-19	-9	-73	-90	
	26	-28	-12	19	78		
	-83	-23	-4	48	-60		
	-125	-29	25	17	-50		
	-71	11	-8	-122			
	-31	-28	8	-90			
	-64	-39	2	15			
	-25	-39	-105	32			
	-20	-12	10	29			
	-7	6	20	34			
	0	8	11	33			
	-29	-14	44	44			
	-41	-56	50	-24			
	-114	-64	58	-6			
	-80	6	23	-48			
	-59	18	19	-98			
	-9	-31	23	-15			
	-4	40	3	18			
	-104	54	-3	4			
	-104	23	-69	-52			
	66	15	-18	-67			
	-42	17	10				
	20	-84	-2				
	32	15	27				
	24	28	26				
	28	-7	29				
	24	0	20				
	30	2	47				
	-84	35	9				
	28	41	-39				
	36	32	-142				
	47	-10	3				
	36	13	25				
	9	16	27				
	-25	72	16				
	-12	59	33				
	-24	32	30				
	2	17	14				
	-2	19	11				
	-13	80	-117				
	-9	-103					
	-23	-101					
	-13						
	-17						
	-22						
	5						
	-30						
	-11						
	-31						
	-26						
	-13						
	16						
	9						
	11						
	6						
	0						
	9						
	-5						
	-48						
	-12						
	26						
	-21						
	-20						
	-3						
	12						
	8						
	34						
	19						
	36						
	19						
	9						
	50						
	-143						
	-118						
	-114						
Average:		-1	2	-12	-6	-30	-110
Std Dev:		41	43	48	57	140	#DIV/0!
RMS:		40	43	48	53	125	110
Maximum:		80	66	48	78	179	-110
Minimum:		-103	-142	-122	-73	-115	-110

Radar Profiler - Sodar Wind Speed Comparison

Site: Los Angeles International Airport
Date: July 6 - 15, 1997
Measurements Group: NOAA-ETL
Radar Profiler: NOAA-ETL
Audit Sodar: AeroVironment Model 2000

High Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-1.4
Maximum:	2.3
Minimum:	-4.2
Standard Deviation:	1.1
Root Mean Square (RMS):	1.8

	Wind Speed Difference (m/s, RWP - Sodar) Range Gates (meters)						
	194	292	390	488	586	684	782
	-0.6	-0.8	-0.4	-1.4	0.8	-2.7	-1.4
	-0.2	-2.3	-1.3	-0.9	1.1	-1.8	
	-1.1	-0.3	-0.8	-1.7	-0.3	-1.6	
	-2.2	-2	-1.2	-2.1	-1.7	-1.4	
	-2.4	-0.6	-3	-2.1	-3.2		
	-0.8	-0.8	-2.1	0.4	-3		
	-1.4	-0.8	-2.2	-2.1	-2.5		
	-3.2	-1.3	-2.9	-1.9			
	-2.8	-1.9	-3.8	-1.2			
	-3.5	-2.3	-1.4	-1.9			
	-2.1	-0.1	-1.1	-2.1			
	-0.9	-2.2	-2.2	-2.1			
	-1.7	-2.7	-1.2	-1.6			
	-0.8	-1	-1.2	-0.6			
	-1.1	-1.8	-0.5	-1.3			
	-0.9	-0.9	-0.4	-2.9			
	-0.9	-3.4	-0.6	-2			
	-2.5	-0.6	-0.9	-2.3			
	-4.2	-2.5	-0.8	-2.5			
	-0.5	-1.1	-0.2	-2.7			
	-2.2	1	-1.6	-2.1			
	-1.6	0.4	-2	-1.5			
	-0.8	-0.5	-1.5	-2			
	-2.2	-1.5	-1.9	-2.1			
	-1.7	-0.9	-2.3				
	-2.2	-1.3	-1.7				
	-3	-3.3	-0.2				
	-1.5	-0.8	0.5				
	-1	-1.7	0.7				
	0.4	-1.7	-0.7				
	0.4	-1.9	-1.7				
	-2.6	1	-1.5				
	-0.9	1.1	-3.5				
	-1.7	1.4	-2.1				
	-0.4	-1.8	-1.5				
	1.1	-1.2	-2.2				
	0	-1.5	-2				
	-1.9	-2	-1.6				
	-1.3	-1	-0.7				
	-2.5	0.4	0.8				
	-2.3	-1.2	-1.9				
	-3.9	-1.5	-0.1				
	-3.7	-1.3	-0.8				
	-3	-1.8					
	-1.2	-0.1					
	-3.9						
	-1.2						
	-2						
	-2.7						
	-1.3						
	-3						
	-2.8						
	-2.2						
	-1.5						
	-1.3						
	-1.1						
	-0.2						
	-1.2						
	-2.3						
	-2.5						
	-1.2						
	-0.3						
	-4						
	-0.9						
	-1.2						
	-1.6						
	-0.3						
	2.3						
	1						
	-1						
	-1.2						
	0						
	-0.7						
	-1.4						
	-2.3						
	-0.6						
	-2.1						
	0						
Average:		-1.1	-1.3	-1.8	-1.3	-1.9	-1.4
Std Dev:		1.1	1.0	0.7	1.8	0.6	#DIV/0!
RMS:		1.6	1.7	1.9	2.1	1.9	1.4
Maximum:		1.4	0.8	0.4	1.1	-1.4	-1.4
Minimum:		-3.4	-3.8	-2.9	-3.2	-2.7	-1.4

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: LAX
Date: June 26 - 27, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-2.4
Maximum:	4.0
Minimum:	-10.6
Standard Deviation:	3.2
Root Mean Square:	4.0

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-9
Maximum:	149
Minimum:	-177
Standard Deviation:	86
Root Mean Square:	86

WS Difference (m/s)			
Altitude	6/26/97 2100	6/26/97 1500	6/27/97 700
194	-6.2	-3.8	-0.9
292	-5.7	-2.7	-2.4
390	-5.6	-0.8	-0.3
488	-7.1	-1.0	
586	-10.4	-3.0	-2.0
684	-10.6		-1.0
782	-8.8	-1.4	-4.1
880	-4.4	-2.6	-5.3
978	0.5	-1.8	-3.1
1076	-0.8		0.2
1174			3.2
1272	-6.6	-1.1	0.1
1370	-2.5	-0.9	4.0
1468		-0.9	3.7
1566		-2.0	0.9
1664		-3.7	-1.4
1762		-4.7	
1860			-0.3
1959			2.3
2057			-1.0
2155			
2253			
2351		-1.7	
2449		0.1	
2547			
2645			
2743			
2841			-2.6
2939	-6.2		-1.2
3037			-0.2
3135	-8.4		1.7
3233	-4.7	-1.8	
3331	-1.5		
3429	-1.1		
3527	-3.5		
3625	-6.9	-0.3	
3723			
3821			
3919			
Average:	-5.3	-1.9	-0.4
Maximum:	0.5	0.1	4.0
Minimum:	-10.6	-4.7	-5.3
Std Dev:	3.2	1.3	2.4
RMS:	6.1	2.3	2.4

WD Difference (deg)			
Altitude	6/26/97 2100	6/26/97 1500	6/27/97 700
194	44	-12	-156
292	49	-13	109
390	61	25	149
488	58	73	
586	14	130	-142
684	-36		-76
782	-51	-1	-38
880	-64	6	-45
978	-40	-4	-116
1076	28		-143
1174			-161
1272	147	8	-177
1370	-72	7	147
1468		41	130
1566		43	106
1664		43	74
1762		80	
1860			85
1959			80
2057			78
2155			
2253			
2351		-14	
2449		-6	
2547			
2645			
2743			
2841			-101
2939	-173		-97
3037			-98
3135	-88		-103
3233	-41	-75	
3331	-35		
3429	-47		
3527	-65		
3625	-77	37	
3723			
3821			
3919			
Average:	-20	20	-23
Maximum:	147	130	149
Minimum:	-173	-75	-177
Std Dev:	72	45	116
RMS:	73	49	116

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: LAX
Date: June 26 - 27, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-3.2
Maximum:	1.2
Minimum:	-12.5
Standard Deviation:	3.5
Root Mean Square:	4.7

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	21
Maximum:	155
Minimum:	-74
Standard Deviation:	55
Root Mean Square:	58

	WS Difference (m/s)		
Altitude	6/26/97 2100	6/27/97 700	6/27/97 1500
159			
215	-5.7		-2.1
271	-6.1	-3.4	-1.4
327	-5.7	-1.3	0.6
383	-6.8		-1.3
439	-7.8	-2.4	-2.3
495	-8.6		-1.0
551	-12.5	-1.6	-1.7
607	-12.0	-2.6	
663	-11.1	-3.8	-0.3
719	-8.9	-3.9	
775	-8.0	-4.5	-2.4
831	-7.6	-2.1	-2.7
887	-4.7	0.2	-3.0
943		0.3	-1.4
999		-0.8	-1.2
1055	1.2	-0.4	
1111	-0.4	0.0	
1167			
1223	-1.4		
1279	-9.0		-0.6
1335		-0.4	-0.9
1391		-0.4	-1.3
1447		-0.4	0.5
Average:	-6.8	-1.6	-1.3
Maximum:	1.2	0.3	0.6
Minimum:	-12.5	-4.5	-3.0
Std Dev:	3.8	1.6	1.0
RMS:	7.7	2.2	1.6

	WD Difference (deg)		
Altitude	6/26/97 2100	6/27/97 700	6/27/97 1500
159			
215	53		-16
271	67	-51	1
327	61	-23	29
383	62		81
439	59	125	123
495	54		149
551	47	90	155
607	19	43	
663	-21	20	-31
719	-44	41	
775	-49	19	-13
831	-60	1	-14
887	-74	1	-27
943		-3	-30
999		-2	-25
1055	10	-9	
1111	33	-6	
1167			
1223	149		
1279	70		6
1335		-12	11
1391		-17	19
1447		-24	44
Average:	26	11	27
Maximum:	149	125	155
Minimum:	-74	-51	-31
Std Dev:	59	43	63
RMS:	62	44	66

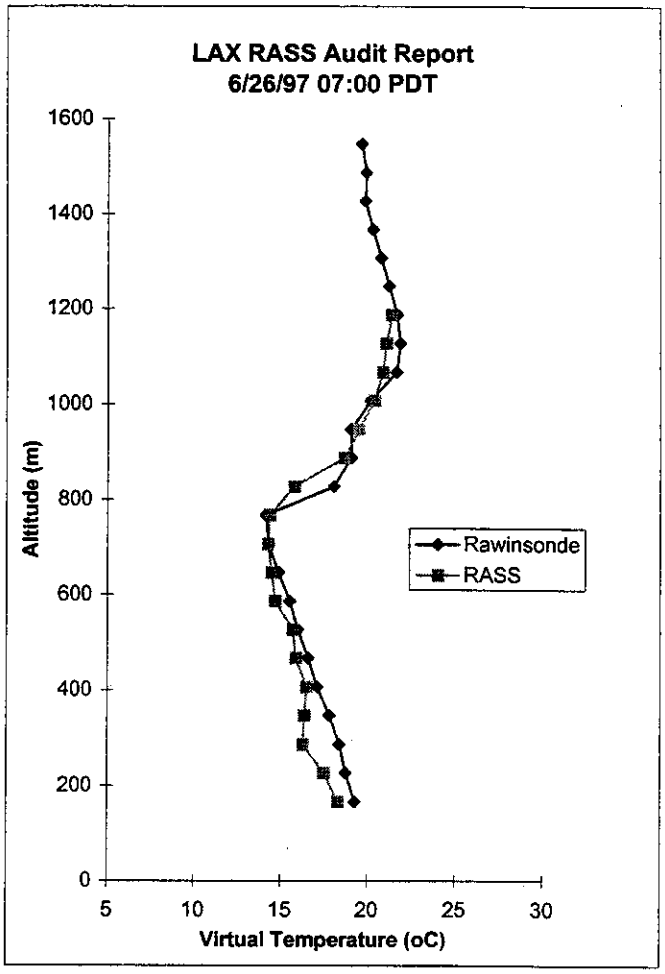
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/26/97
Start: 07:00 PDT
End: 07:34 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: LAX Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1547	-950	19.7	NA
1487	-950	19.9	NA
1427	-950	19.9	NA
1367	-950	20.3	NA
1307	-950	20.8	NA
1247	-950	21.3	NA
1187	21.4	21.7	-0.3
1127	21.1	21.9	-0.8
1067	20.9	21.7	-0.8
1007	20.4	20.2	0.2
947	19.5	19.1	0.4
887	18.7	19.1	-0.4
827	15.8	18.1	-2.3
767	14.4	14.2	0.2
707	14.3	14.3	0.0
647	14.5	14.9	-0.4
587	14.7	15.5	-0.8
527	15.7	16.0	-0.3
467	15.9	16.6	-0.7
407	16.5	17.1	-0.6
347	16.4	17.8	-1.4
287	16.3	18.4	-2.1
227	17.5	18.8	-1.3
167	18.3	19.3	-1.0



Results Summary

Min. Diff. :	-2.3
Max Diff. :	0.4
Ave. Diff. :	-0.5
Std. Dev. :	0.9

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535094
Td offset (oC):	0.3
RH offset (%)	3.0
Sonde Pressure (mb):	1010.4
Ref Pressure (mb):	1011.1
Difference (mb):	-0.7

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

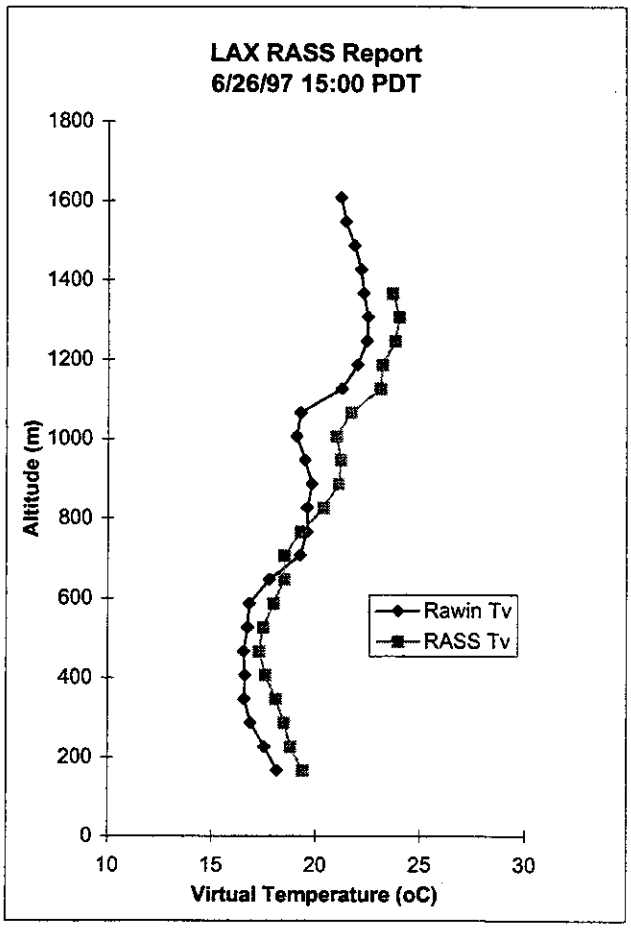
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/26/97
Start: 15:00 PDT
End: 15:32 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: LAX Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1607	-950	21.2	NA
1547	-950	21.5	NA
1487	-950	21.9	NA
1427	-950	22.2	NA
1367	23.7	22.3	1.4
1307	24	22.5	1.5
1247	23.8	22.5	1.4
1187	23.2	22.0	1.2
1127	23.1	21.3	1.8
1067	21.7	19.3	2.4
1007	21	19.1	1.9
947	21.2	19.5	1.7
887	21.1	19.8	1.3
827	20.4	19.6	0.8
767	19.3	19.6	-0.3
707	18.5	19.3	-0.8
647	18.5	17.8	0.7
587	18	16.8	1.2
527	17.5	16.8	0.8
467	17.3	16.6	0.7
407	17.6	16.6	1.0
347	18.1	16.6	1.5
287	18.5	16.9	1.6
227	18.8	17.6	1.2
167	19.4	18.2	1.2



Min. Diff. : 0.8
Max Diff. : 2.4
Ave. Diff. : 1.5
Std. Dev. : 0.4

Audit Criteria: +/- 1oC

Audit Sonde Data
Sonde Serial # : 1536221

Td offset (oC): -3.3
RH offset (%) 2.0

Sonde Pressure (mb): 1010.4
Ref Pressure (mb): 1008.6
Difference (mb): 1.8

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

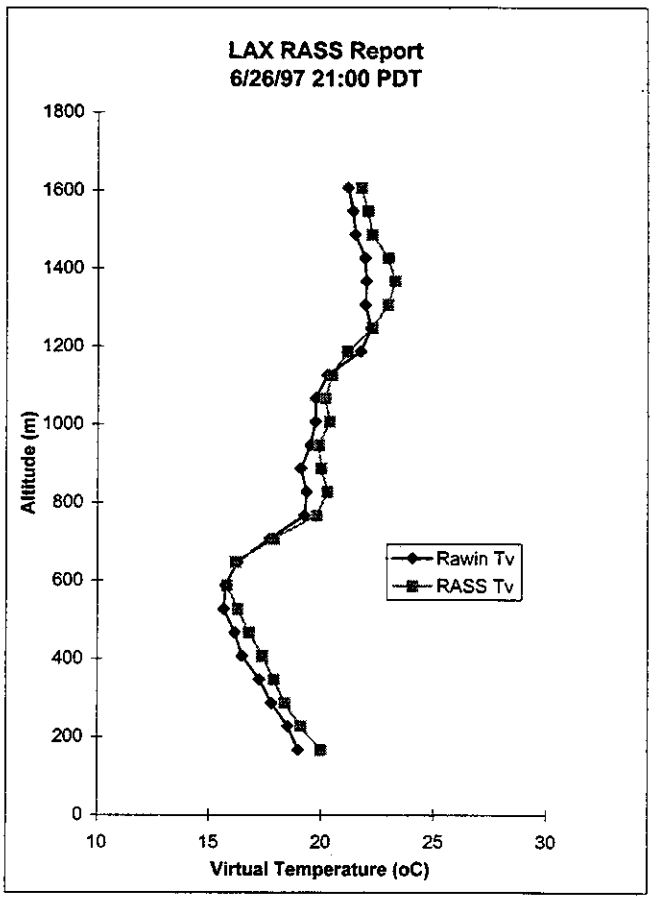
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/26/97
Start: 21:00 PDT
End: 21:27 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: LAX Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1607	21.8	21.2	0.6
1547	22.1	21.5	0.7
1487	22.3	21.5	0.8
1427	23.0	22.0	1.0
1367	23.3	22.0	1.3
1307	23.0	22.0	1.0
1247	22.3	22.2	0.1
1187	21.2	21.8	-0.6
1127	20.5	20.3	0.2
1067	20.2	19.8	0.4
1007	20.4	19.8	0.6
947	19.9	19.5	0.4
887	20.0	19.1	0.9
827	20.3	19.4	0.9
767	19.8	19.3	0.5
707	17.9	17.7	0.2
647	16.2	16.3	-0.1
587	15.8	15.7	0.1
527	16.3	15.7	0.6
467	16.8	16.2	0.6
407	17.4	16.5	0.9
347	17.9	17.3	0.6
287	18.4	17.8	0.6
227	19.1	18.5	0.6
167	20.0	19.0	1.0



Min. Diff. : -0.6
Max Diff. : 1.3
Ave. Diff. : 0.6
Std. Dev. : 0.5

Audit Criteria: +/- 1oC

Audit Sonde Data
Sonde Serial # : 1535429

Td offset (oC): 2.4
RH offset (%) 0.0

Sonde Pressure (mb): 1010.7
Ref Pressure (mb): 1010.4
Difference (mb): 0.3

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

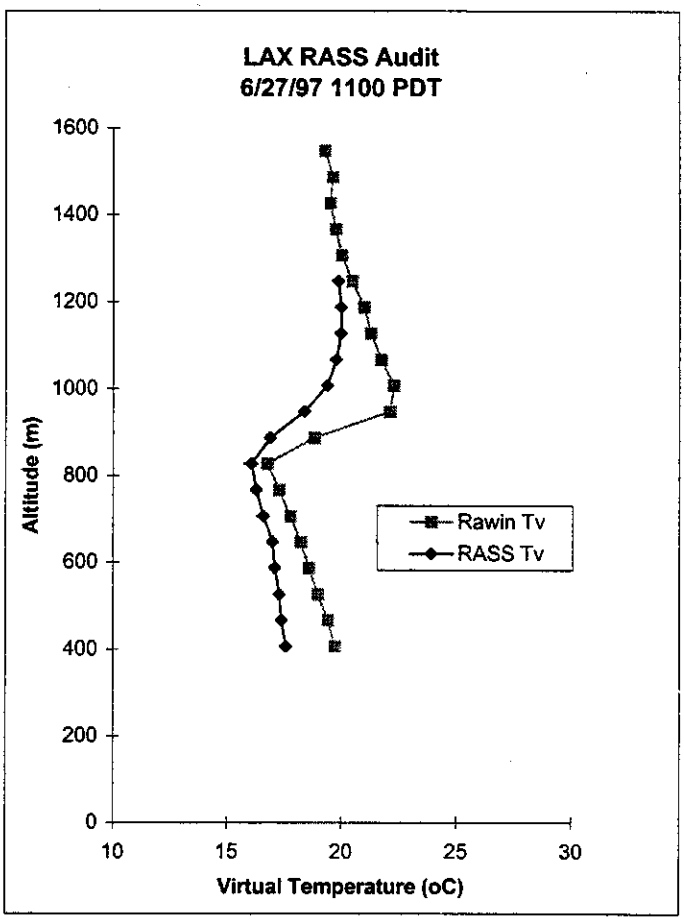
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 6/27/97
Start: 11:00 PDT
End: 11:30 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: LAX Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1547	-950	19.3	NA
1487	-950	19.6	NA
1427	-950	19.5	NA
1367	-950	19.8	NA
1307	-950	20.0	NA
1247	19.9	20.5	-0.6
1187	20	21.0	-1.0
1127	20	21.3	-1.3
1067	19.8	21.8	-2.0
1007	19.4	22.3	-2.9
947	18.4	22.1	-3.7
887	16.9	18.8	-1.9
827	16.1	16.8	-0.7
767	16.3	17.3	-1.0
707	16.6	17.8	-1.2
647	17	18.2	-1.2
587	17.1	18.6	-1.5
527	17.3	19.0	-1.7
467	17.4	19.4	-2.0
407	17.6	19.7	-2.1



Results Summary

Min. Diff. :	-3.7
Max Diff. :	-0.6
Ave. Diff. :	-1.7
Std. Dev. :	1.1

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	1535438
Td offset (oC):	-0.1
RH offset (%)	1.0
Sonde Pressure (mb):	1013.3
Ref Pressure (mb):	1013
Difference (mb):	0.3

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

NORTON (NTN)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	San Bernardino (Norton)
Audit Dates:	6/20/97
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Reggie Smith
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site operator is the CARB technician who has operated RWP and RASS for a number of field programs and is very familiar with the systems.

Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

1. The site is located under the approach to the San Bernardino Airport (formerly Norton AFB). This does not present a problem due to very light air traffic into and out of this airport.
2. The site is located approximately 100 feet north of Central Avenue. Traffic is approximately 350 vehicles per hours.
3. Power lines 50' high are approximately 100' south of the site.
4. Trees approximately 50' tall are approximately 200' south of the site.
5. Power lines 50' high are 600' to the east.
6. Power lines 50' high are 600' to the north.

SYSTEM AUDIT NOTES

1. The RASS is set to collect data at 210 meter intervals starting at 285 meters up to 2185 meters. Collecting RASS in this mode may miss much of the surface stability structure.

2. The high mode winds are set to collect data at 210 meter intervals with a pulse length of 400 meters. Other participants are collecting the high modes winds at 100 meter intervals.

POTENTIAL ACTIVE NOISE SOURCES

None noted.

POTENTIAL PASSIVE NOISE SOURCES

1. Power lines to the south may produce clutter when it is windy.

ANTENNA LEVEL AND ALIGNMENT

1. Antenna orientation: Audit = 218°. Station = 216°. Okay.
2. Antenna level: NW-SE = 0.9°, NE-SW = 0.3°. NW-SE level exceeds the criteria of ±0.5° and should be adjusted.
3. Acoustic source level: Okay.

RADAR PROFILER PERFORMANCE AUDIT

No applicable. System audit only.

RASS PERFORMANCE AUDIT

Not applicable. System audit only.

RADAR PROFILER DATA INTERNAL CONSISTENCY

No problems noted.

RASS DATA INTERNAL CONSISTENCY

No problems noted.

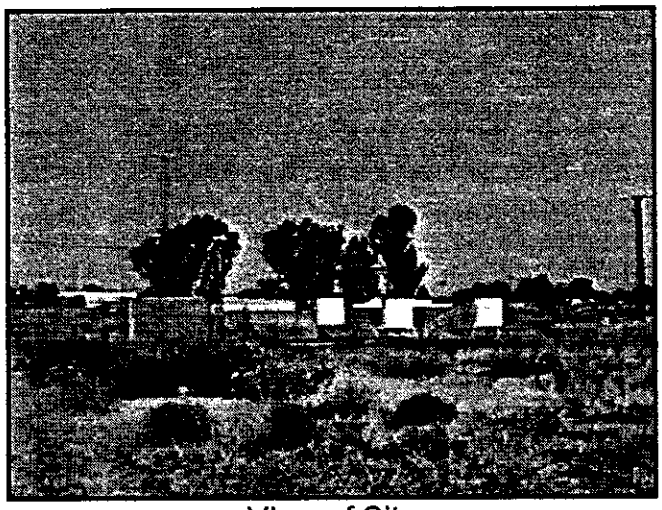
SURFACE METEOROLOGY SYSTEM AUDIT

1. The surface meteorology, with the exception of relative humidity and the wind sensor crossarm orientation was not audited. CARB uses a snorkel truck to reach the sensor which was not available on the day of the audit.
2. The trees to the south of the site present an obstruction to the wind measurements. Objects such as buildings and trees should be at least 10 times

the height of the object away from the wind sensors to not be an obstruction in accordance with the EPA recommended guidelines.

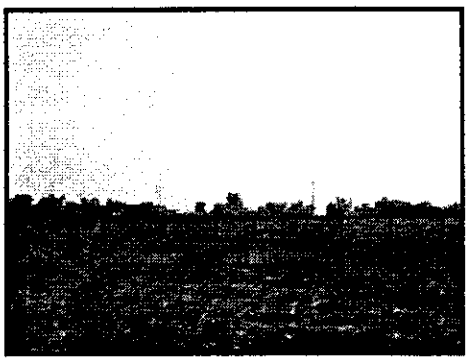
3. The wind vane is warped and should be changed.
4. Relative Humidity and the wind sensor crossarm were both within the audit criteria.

San Bernardino (Norton) Site
Vista Diagram



View of Site

North View



Northeast View

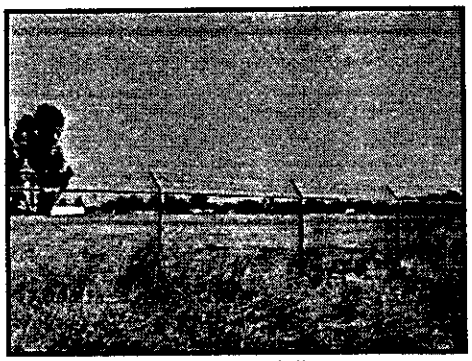
East View

Southeast View

South View

Southwest View

West View



Northwest View

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	CARB
SITE NAME AND LOCATION:	San Bernardino Airport (Norton)
AUDITOR:	Alex Barnett
DATE:	June 20, 1997
KEY PERSON:	Reggie Smith

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Upper level winds and virtual temp.	Radar profiler and RASS	Radian	LAP-3000		
Wind speed		Met One	010C	P1068	0 - 50 m/s
Wind dir.		Met One	020C	P3074	0 - 540°
Amb. Temp.		Met One	060-A	P8708	
Rel. Hum.		Met One	083	P6285	0 - 100%

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Radar panel	Ball	915 MHz	0111-0114	
Final amplifier	Radian		CARB 2	
Audio amp.	Peavey	CS-800X	07432369	
Interface	Radian	LAP-3000	7204	
Receiver/Mod.	Radian	LAP-3000	7188	
Radar Comp.	IBM	6492-L4F	23CHKVD	
Gateway Comp	IBM	6492-L4F	23CHKMV	
Data logger	ESC	8800	1447	

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Ear defenders				
Bubble level				
Ladder				

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler and RASS

Variable	Value	Meet SOP (Yes/No)
1. Orientation	218°	Yes
2. Level	NW-SE: 0.9° NE-SW: 0.3°	No[2]
3. Distance to closest obstruction	None	Yes
4. Distance to closest active noise source	200'	Yes[1]

Comments:

1. Power lines and trees to the south of the site may produce ground clutter during windy conditions. It was relatively calm during the audit. No evidence of ground clutter was present during that period.
2. NW-SE level should be adjusted.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 meters	Yes
2. Distance to nearest obstacle	200'[1]	No
3. Is separation at least 10x obst. Height?	Yes	Yes
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5X height above the roof?	NA	NA
6. Arc of unrestricted flow?	360°	Yes
7. Height of temp sensor above ground.	3 meters	Yes
8. Distance of temp sensor from obst.	None	yes
9. Hgt of Dew pt/RH sensor above ground.	3 meters	Yes
10. Distance Dew pt/RH sensor from obst.	None	Yes
11. Are the distances 4X from obst. Hgt.?	NA	NA
12. Is sensor shielded/motor asp?	Yes	Yes
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the on site equipment and the monitoring plan?	No	Yes

Comments:

1. Trees to the south of the site are closer than the EPA recommended criteria of 10 times the height of the potential obstruction.

III. Operation

A. Radar Profiler, RASS, and Surface Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	NA	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

B. Radar Profiler Settings

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Software version?	POP-3 v1.41B	Yes
2.	High mode wind pulse length?	400 meters	Yes
3.	Low mode wind pulse length?	60 meters	Yes
4.	Time zone	PST	No
5.	Wind data consensus		
6.	RASS consensus		

	Wind Low Mode	Wind High Mode	RASS
First Gate	0.12 km	0.34 km	0.28 km
Last Gate	1.86 km	4.34 km	2.17 km
Spacing	60.0 m	210.0 m	210.0 m
Full Scale Velocity	10.2 m/s	31.2 m/s	409.8 m/s

Comments:

C. Auxiliary Equipment

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	No	
3.	Is the site temperature maintained at 20-30°C?	yes	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	yes
6.	Does the telephone work?	Yes	yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

C. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes[1]	Yes
2.	Are the station logs up to date?	Yes[1]	Yes
3.	Do station logs contain details as required by the SOPs?	Yes[1]	Yes
4.	Are routine checklists used?	Yes[1]	Yes
5.	Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6.	Are the calibration forms present?	Yes	Yes
7.	Do the calibration forms contain details as required by the SOPs?	Yes	Yes
8.	Are the SOPs present?	Yes	Yes
9.	Are the instrument manuals present?	Yes	Yes
10.	Do the SOPs include quality control tests?	Yes	Yes
11.	If quality control tests are included then how are the results of the tests documented?	On Maint. Sheet	Yes
12.	Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13.	Is the site visited twice weekly?	Twice monthly	Yes
14.	Does the site technician understand the SOPs?	Yes	Yes

Comments:

1. The LAP-3000 Monthly Maintenance Sheet is used to record all checks performed and action taken.

D. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments: No paper work.
2.	How are data stored?	Computer hard disk
3.	How often are the data backed up?	Polled daily by Sacramento Office.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	Yes	Yes
2.	Is preventive maintenance being performed?	Yes	Yes
3.	Are field operators given special training in preventive maintenance?	Yes	Yes
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5.	Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2.	Does the siting meet the program objectives?	Yes[1]	Yes[1]
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?	Yes	Yes
6.	Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

1. With the exception of the trees and power lines to the south, the siting appears to meet the objectives of the study. The data collected to this point indicates that the trees and power lines have had minimal effect on the data.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	SBD (Norton)	Instrument:	LAP-3000
Date:	6/20/97	Receiver s/n:	7188
Time:	09:00 PDT	Interface s/n:	7204
Measurements group:	CARB	Frimware version:	POP-3
Key contact:	Reggie Smith	System rotation angle:	218° True
Audited by:	Alex Barnett	Measured orientation:	216 ° True
Site longitude:	117° 15.92' W	Orientation difference:	2 °
Site latitude:	34° 05.15'N	Array level:	NW-SE: 0.9 ° NE-SW: 0.3 °
Site elevation:	915'	Beam zenith angle:	23 °
Magnetic declination:	14°E	Beam directions:	SE & SW - Low mode. NE & NW - High mode.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	10	50' pole next to antennas. 50' power lines ~1000'
NA	30	10	50' power lines ~800'
NA	60	10	50' power lines ~600'
NA	90	10	50' power lines ~600'
NA	120	35	15' building ~ 50'. 50' power lines ~6000'
NA	150	40	50' power lines ~150'. 50' trees ~250'
NA	180	45	50' power lines ~100'. 50' trees ~200'
NA	210	40	50' power lines ~150'. 50' trees ~250'
NA	240	30	50' power poles ~200'. 50' tree ~200'
NA	270	10	30' trees ~ 800'.
NA	300	10	30' trees ~ 800'.
NA	330	5	20' trees ~ 1500'.

Comments: Trees and power lines to the south side can cause ground clutter during windy conditions. Low mode beams are Southeast and Southwest. High mode beams are Northeast and Northwest.

ONTARIO INTERNATIONAL AIRPORT (ONT)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site:	Ontario International Airport (ONT)
Audit Dates:	November 21, 1997
Instrumentation Audited:	Radar Profiler, RASS, Surface Meteorology
Key Person(s):	Kevin Durkee
Auditor:	Alexander N. Barnett

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems with the audit equipment occurred during the audit.

SITE CHARACTERISTICS

The site is located at the east end of the Ontario International Airport approximately 100 meters east of the east end of the south taxi way. To the immediate south side is the UPS aircraft ramp. The eastern exposure is an open area with airport fence approximately 200 meters away. To the north approximately 30 meters away is the RWP/RASS instrument shelter and the surface meteorological sensor tower. Beyond that are the east ends of the airport main runways and the new terminal buildings approximately ½ mile away. The western exposure has an FAA equipment structure (single story) approximately 50 meters away and beyond are the main runways.

SYSTEM AUDIT NOTES

1. The orientation of the RWP antenna was set to 148° , the audit measured the orientation at 149°. The operator decided to leave the set up as is.

2. The level of the northeast RASS acoustic sources exceeded the EPA PAMS recommended criteria of ± 1.0°. The level of the acoustic source antennas should be adjusted to within the audit criteria. It is recommended that SCAQMD purchase a digital level to use in the antenna setups. It was previously found that ½ bubble, for the liquid filled levels, is equivalent to more than 2°.
3. The wind direction sensor was rotated -30° from true north. Additionally, the wind vane was not properly secured to the sensor shaft and the crossarm and sensors were not tighened sufficiently to prevent them from being moved by the wind. The sensor orientation was corrected, and the sensor and crossarm secured following the audit. No further actions are required.
4. The temperature sensing system and the audit determined temperature differed by more than the EPA recommended criteria of ± 0.5°C. The temperature sensing system should be adjusted and recalibrated.
5. The temperature sensor should be mounted 2 meters above representative terrain. The temperature sensor was found to be mounted 9 meter above ground level.
6. The temperature sensor is in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
7. The barometric pressure sensing system output differed from the audit barometer reading by more than the EPA recommended criteria of ± 2 mb. The barometric pressure sensing system should be adjusted and recalibrated.

POTENTIAL ACTIVE NOISE SOURCES

No RFI was detected from a scan of the frequencies between 914 and 916 mHz during a listen only check. The site operator reported that the proximity of the RASS sources to the RWP antenna occasionally results in interference with the first two range gates. This interference was not noted at the time of the audit. The manufacturer recommended that the RASS sources be moved further away from the RWP antenna.

POTENTIAL PASSIVE NOISE SOURCES

No passive sources were noted.

ANTENNA LEVEL AND ALIGNMENT

1. The RWP pointing angle was set to 148°. The audit determined pointing direction was 149°, a difference of -1°.
2. The level of all of the RASS acoustic source antennas were outside of the EPA PAMS criteria of ±1.0°.

RADAR PROFILER PERFORMANCE AUDIT

- **RWP Wind – Audit Rawinsonde Comparison**

The results of the comparison between the audit rawinsonde wind data with the radar profiler winds were as follows:

	Low Mode		High Mode	
	Wind Direction (deg)	Wind Speed (m/s)	Wind Direction (deg)	Wind Speed (m/s)
Average Difference	14	-0.2	2	-1.6
Standard Deviation	45	3.2	34	1.6
Root Mean Squared	47	3.2	39	2.6

Criteria: ± 10° - wind direction
± 1.0 m/s - wind speed.

For the low mode wind direction average difference of 14° that exceeded the audit criteria, large differences are noted in layers where direction wind shear occurs. The RWP consensus averaging technique tends to note directional wind shear at higher altitudes than noted by the rawinsonde data (10:00 PDT sounding at 550 meters, 14:00 PDT sounding at 495 meters). Additionally, the automatic data screening and post processing screening routines do not always catch questionable data and flag them appropriately (22:00 PDT sounding at 550 and 880 meters).

For the high mode wind speed average difference of -1.6 m/s that exceeded the audit criteria, the RWP underestimated the wind speed, as compared with the rawinsonde data between the altitudes of approximately 1300 and 2500 meters. The reason for this is not clear at this time, but should be investigated further.

- **RWP Wind – Audit Sodar Comparison**

The results of the comparison between the audit sodar wind data with the radar profiler winds were as follows:

	Low Mode		High Mode	
	Wind Direction (deg)	Wind Speed (m/s)	Wind Direction (deg)	Wind Speed (m/s)
Average Difference	-2	-0.4	1	-0.6
Root Mean Squared	15	0.9	30	1.2

Criteria: ± 10° - wind direction
± 1.0 m/s - wind speed.

RASS PERFORMANCE AUDIT

Four rawinsonde soundings were made at the ONT site. For the 22:00 PDT sounding, the average difference is -3.7°C. A review of the data indicates that the discrepancy may be attributed to the rawinsonde temperature readings. This comparison was not included in the analysis. For the 14:00 PDT sounding, the rawinsonde temperature data was not available. The 06:00 PDT and 10:00 PDT comparisons revealed the following:

1. The RASS tends to overestimate the heights of the inversions.
2. The RASS tends to underestimate the strength of inversions, and the RASS data appears smoothed as compared with the rawinsonde data.

RADAR PROFILER DATA INTERNAL CONSISTENCY

1. A review of the low mode wind data collected during the period of the audit, showed a lot of missing data codes. The missing data codes were not always at the same altitudes but a general pattern emerged as follows: There were missing data codes for the range gates between 500 and 700 meters and from about 1,200 meters to the top of the vertical range for the hours from midnight to 06:00 PST. From 07:00 PST to 12:00 PST missing data codes appear at most levels, particularly at the bottom and tops of the soundings. From 13:00 PST through 17:00 PST data was available for almost all levels. From around 18:00 PST through midnight, missing data codes are present for most range gates.
2. The high mode wind data is restricted to the below between 2,000 to 2,500 meters during the evening and morning hours and to between 3,000 to 3,500 meters between 11:00 PST and 17:00 PST.

RASS DATA INTERNAL CONSISTENCY

1. The RASS data collected during the period of the audit show that the RASS was, for the most part, able to collect data throughout its vertical operating range. The data look reasonable for the area and times of day.

SURFACE METEOROLOGY PERFORMANCE AUDIT

1. All sensors are scanned every 10 seconds with five minute averages recorded. Other than the wind direction alignment error, no problems were noted with the performance audit results. However, not all of the variables could be audited completely. A summary of these audits are provided below:
   - The temperature sensor could not be immersed in water and the probe design was not conducive to placement in a water proof sheath while retaining good thermal conductivity. Only one ambient comparison point was therefore audited.
   - Wind data recorded include scalar wind speed and resultant vector wind direction.
   - As indicated above, the 10 meter wind direction sensor orientation was outside of criteria which produced a total error of 9°. The sensor was aligned following the audit and the new alignment verified.

2. The wind direction sensor was rotated -30° from true north. Additionally, the wind vane was not properly secured to the sensor shaft and the crossarm and sensors were not tighened sufficiently to prevent them from being moved by the wind. The sensor orientation was corrected, and the sensor and crossarm secured following the audit. No further actions are required.
3. The temperature sensing system and the audit determined temperature differed by more than the EPA recommended criteria of ± 1.0°C. Should be adjusted and recalibrated.
4. The temperature sensor should be mounted 2 meters above representative terrain. The temperature sensor was found to be mounted 9 meter above ground level.
5. The temperature sensor is in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.
6. The barometric pressure sensing system output differed from the audit barometer reading by more than the EPA recommended criteria of ± 2 mb. The barometric pressure sensing system should be adjusted and recalibrated.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	SCAQMD
SITE NAME AND LOCATION:	Ontario Airport
AUDITOR:	Alex Barnett
DATE:	November 21, 1997
KEY PERSON:	Kevin Durkee

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Upper level winds and virtual temp.	Radar profiler and RASS	Radian	LAP-3000		
Wind speed		Met One	1564D	N1725	0 - 100 mph
Wind dir.		Met One	1565D	N1825	0 - 360°
Amb. Temp.		Met One	083C-1-35	U3378	-50° - 50°C
Bar. Press.		Met One	091-26/32-1	U1996	600 - 1100mb

Comments:

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? No

Do any operating ranges differ from those specified in the SOP? No

Are there any significant differences between instrumentation on site and the SOP? No

Comments:

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Radar panel	Ball	915 MHz		
Final amplifier	Radian			
Audio amp.	Peavey	CS-800X		
Interface	Radian	LAP-3000	5207	
Receiver/Mod.	Radian	LAP-3000	5213	
Radar Comp.	IBM			
Gateway Comp	IBM			
Data logger	Met One			

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Ear defenders				
Bubble level				
Ladder				

Comments:

II. Sensor/Probe height and Exposure

A. Radar Profiler and RASS

Variable	Value	Meet SOP (Yes/No)
1. Orientation (X+)	149°	Yes
2. Level	NW-SE: 0.2° NE-SW: 0.3°	Yes
3. Distance to closest obstruction	None	Yes
4. Distance to closest active noise source	None	Yes[1]

Comments:

1.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 meters	Yes
2. Distance to nearest obstacle	None	Yes
3. Is separation at least 10x obst. Height?	NA	Yes
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5X height above the roof?	NA	NA
6. Arc of unrestricted flow?	360°	Yes
7. Height of temp sensor above ground.	10 meters	No[1]
8. Distance of temp sensor from obst.	None	Yes
9. Hgt of Dew pt/RH sensor above ground.	NA	NA
10. Distance Dew pt/RH sensor from obst.	NA	NA
11. Are the distances 4X from obst. Hgt.?	NA	NA
12. Is sensor shielded/motor asp?	No	Yes[2]
13. Are temp/Dew pt/RH sensor above representative terrain?	Yes	Yes
14. Are there any significant differences between the site equipment and the monitoring plan?	No	Yes

Comments:

1. The U.S. EPA recommends that temperature sensors be mounted 2 meters above representative terrain.
2. The temperature sensor aspirator was not motorized. The temperature data should not be used for modeling inputs.

III. Operation

A. Radar Profiler, RASS, and Surface Meteorology

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is all instrumentation operational?	Yes	Yes
2.	Are all cables secure?	Yes	Yes
3.	Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4.	Are connections clean and rust free?	Yes	Yes
5.	Are serial numbers available?	Yes	Yes
6.	Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7.	Is the printer functional?	NA	Yes
8.	Overall, is the site maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

B. Radar Profiler Settings

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Software version?	POP- 4.23.01	Yes
2.	High mode wind pulse length?	100 meters	Yes
3.	Low mode wind pulse length?	60 meters	Yes
4.	Time zone	PST	Yes
5.	Wind data consensus	55 minutes	Yes
6.	RASS consensus	5 minutes	Yes

	Wind Low Mode	Wind High Mode	RASS
First Gate	0.15 km	0.17 km	0.12 km
Last Gate	1.59 km	4.27 km	1.56 km
Spacing	60.0 m	105.0 m	60.0 m
Full Scale Velocity	10.2 m/s	10.0 m/s	409.8 m/s

Comments:

C. Auxiliary Equipment

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2.	Is the site temperature recorded?	No	
3.	Is the site temperature maintained at 20-30°C?	Yes	Yes
4.	Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5.	Does the modem work?	Yes	Yes
6.	Does the telephone work?	Yes	Yes
7.	Is the site secure?	Yes	Yes
8.	Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments:

C. Station Check Procedures and Documentation

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Are the station logs present?	Yes[1]	Yes
2.	Are the station logs up to date?	Yes[1]	Yes
3.	Do station logs contain details as required by the SOPs?	Yes[1]	Yes
4.	Are routine checklists used?	Yes[1]	Yes
5.	Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6.	Are the calibration forms present?	Yes	Yes
7.	Do the calibration forms contain details as required by the SOPs?	Yes	Yes
8.	Are the SOPs present?	Yes	Yes
9.	Are the instrument manuals present?	Yes	Yes
10.	Do the SOPs include quality control tests?	Yes	Yes
11.	If quality control tests are included then how are the results of the tests documented?	On Maint. Sheet	Yes
12.	Has the site technician undergone training as specified in the SOPs?	Yes	Yes
13.	Is the site visited twice weekly?	Twice monthly	Yes
14.	Does the site technician understand the SOPs?	Yes	Yes

Comments:

1. The LAP-3000 Monthly Maintenance Sheet is used to record all checks performed and action taken.

D. Chain of Custody

1.	Review paper work for chain of custody from field to data processing.	Comments: No paper work.
2.	How are data stored?	Computer hard disk
3.	How often are the data backed up?	Polled hourly by Diamond Bar office.

Comments:

V. Preventive Maintenance

	Question	Response (Yes/No)	Meet SOP (Yes/No)
1.	Is preventive maintenance discussed in the SOPs?	Yes	Yes
2.	Is preventive maintenance being performed?	Yes	Yes
3.	Are field operators given special training in preventive maintenance?	Yes	Yes
4.	Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	Yes	Yes
5.	Are maintenance logs maintained and reviewed?	Yes	Yes

Comments:

VI. Overall Comments

	Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1.	Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2.	Does the siting meet the program objectives?	Yes	Yes
3.	Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4.	Does the QC program appear to be working?	Yes	Yes
5.	Overall, does the meteorological data look reasonable?	Yes	Yes
6.	Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments:

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	ONT	Instrument:	LAP-3000
Date:	11/21/97	Receiver s/n:	5207
Time:		Interface s/n:	5213
Measurements group:	SCAQMD	Firmware version:	POP-4
Key contact:	Kevin Durkee	System rotation angle:	148° True
Audited by:	Alex Barnett	Measured orientation:	149° True
Site longitude:	117° 34.74'W	Orientation difference:	-1°
Site latitude:	34° 03.22'N	Array level:	NW-SE: 0.2°
			NE-SW: 0.3°
Site elevation:	280 meters	Beam zenith angle:	23.5°
Magnetic declination:	14°E	Beam directions:	148° and 238°

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	10	RWP/RASS instrument shelter and meteorological tower.
NA	30	<2	Runway approach. Chain link fence 200 meter away.
NA	60	<2	Runway approach. Chain link fence 200 meter away.
NA	90	5	Single story warehouse, ~200 meters away.
NA	120	5	Single story warehouse, ~200 meters away.
NA	150	<2	UPS aircraft ramp, 100 meters away.
NA	180	<2	UPS aircraft ramp, 100 meters away.
NA	210	5	UPS facilities building, 100 meters away.
NA	240	5	Control tower, 1 mile away.
NA	270	<2	Airport taxi way.
NA	300	5	FAA beacon structure. Airport main runway.
NA	330	5	FAA beacon structure. Airport main runway.

Comments:

AeroVironment Environmental Services Inc.
HORIZONTAL WIND SPEED

Date: 11/21/97
Start: 12:10 PST
Finish: 12:25 PST
Audited By: Alex Barnett
Witness: Kevin Durkee

Site Name: Ontario
Operator: SCAQMD
Project: SCAQMD Audits

Manufacturer: Met One Instruments
Serial No.: N1725
K factor: 1.4
Range: 100 mph

Model: 1564D
Sensor Ht.: 10 meters
Starting torque: gm cm
Starting threshold: 0.00 mph

Last calibration date:

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Audit Point	MPH Input	MPH Chart	MPH Diff. Chart	MPH DAS	MPH Diff. DAS
1	0.63	#N/A	#N/A	0.71	0.08
2	4.58	#N/A	#N/A	4.60	0.02

Audit Criteria: +/-.56 MPH; ws <= 11.2 MPH

Audit Point	MPH Input	MPH Chart	% Diff. Chart	MPH DAS	% Diff. DAS
3	17.55	#N/A	#N/A	17.50	-0.3
4	34.47	#N/A	#N/A	34.50	0.1

Audit Criteria: +/- 5%; ws > 11.2 MPH

Comments: Not possible to perform starting threshold test.

AeroVironment Environmental Services Inc.
HORIZONTAL WIND DIRECTION

Date: 11/21/97
Start: 11:55 PST
Finish: 12:10 PST
Audited By: Alex Barnett
Witness: Kevin Durkee

Site Name: Ontario
Operator: SCAQMD
Project: SCAQMD Audits

Manufacturer: Met One Instruments
Serial No.: N1825
K factor: 29.8
Range: 360 Deg
Crossarm: 5 Deg true

Model: 1565D
Sensor Ht.: 10 meters
Starting torque: 0.1 gm cm
Starting threshold: 0.06 m/s

Last calibration date:

	Chart	DAS
Slope:	1.000	1.000
Int.:	0.0	0.0

WD Audit Point	Degrees Reference	Degrees Chart	Diff. Chart	Degrees DAS	Diff. DAS
1	5	#N/A	#N/A	335	-30
2	95	#N/A	#N/A	64	-31
3	185	#N/A	#N/A	154	-31
4	275	#N/A	#N/A	245	-30

Audit Criteria: +/- 5 degrees

Comments: Vane was bent.
Vane was not securely attached to sensor shaft.
Crossarm was loose and could rotate on the tower.
Crossarm was not aligned with true north.

AeroVironment Environmental Services Inc.
AMBIENT TEMPERATURE

Date: 11/21/97
Start: 14:07 PST
Finish: 14:15 PST

Site Name: Ontario
Operator: SCAQMD
Project: SCAQMD RWP/RASS

Audits
Audited By: Alex Barnett
Witness: Kevin Durkee

Manufacturer: Met One Instruments
Serial No.: U3378
Lower Range: -50 Deg C
Upper Range: 50 Deg C

Model: 083C-1-35
Sensor Ht.: 10 meters

Last calibration date:

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	24.4	#N/A	#N/A	22.5	-1.9

Audit Criteria: +/- 1.0 degree Celsius

Comments: Sensor was not imersable. Single point comparison only.

AeroVironment Environmental Services Inc.
BAROMETRIC PRESSURE

Date: 11/21/97
Start: 14:30 PST
Finish: 14:35 PST

Site Name: Ontario
Operator: SCAQMD
Project: SCAQMD RWP/RASS

Audits
Audited By: Alex Barnett
Witness: Kevin Durkee

Manufacturer: Met One Instruments
Model: 091-26/32-1
Serial No.: U1996
Lower Range: 990 mb
Upper Range: 1100 mb

Last calibration date:

	Cal. Factors Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

B. Pressure Audit Point	mb Input	mb Chart	mb Diff. Chart	mb DAS	mb Diff. DAS
1	978.71	#N/A	#N/A	974.28	-4.43

Audit Criteria: +/- 2 mb

Comments: None

Radar Profiler - Sodar Wind Speed Comparison

Site: Ontario International Airport
Date: November 5 - 19, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Direction (m/s)
Average:	1
Maximum:	174
Minimum:	-96
Standard Deviation:	30
Root Mean Square (RMS):	30

	Wind Direction Difference (deg, RWP - Sodar) Range Gate (m)						
	158	158	158	254	350	446	542
	4	-16	-12	2	-31		
	-3	-10	1	-38			
	4	-9	33	-8			
	9	-6	-14	4			
	-22	-24	-19	0			
	-1	-60	-96	-21			
	-6	168	17	1			
	-23	31	28	-20			
	18	22	18	-36			
	15	101	5	47			
	-5	60	-13	-15			
	-10	174	-18	-12			
	-1	-1	-23	15			
	-7	-2		-10			
	15	5		10			
	-9	14		-3			
	-2	-12		-15			
	-33	-10		12			
	-1	-15		-3			
	-27	-16		37			
	-13	2		15			
	21	4		15			
	-17	9		-9			
	-10	8		-16			
	-4	-4		-18			
	-4	-2		-23			
	-12	-21		3			
	10	-7		0			
	122	-13		-4			
	-13	-25					
	0	-1					
	-17	8					
	2	-11					
	8	-21					
	-10	4					
	7	-23					
	-1	31					
	0	10					
	-6	-23					
	-11	-1					
	-15	-1					
	-14	-7					
	8	4					
	3	13					
	-10	14					
	-9	26					
	-3	28					
	17	15					
	20	22					
	19	-6					
	-17	11					
	32	-13					
	-7	-26					
Average:			2	-3	-31		
Std Dev:			32	19	#DIV/0!		
RMS:			32	19	31		
Maximum:			174	47	-31		
Minimum:			-96	-38	-31		

Radar Profiler - Sodar Wind Speed Comparison

Site: Ontario International Airport
Date: November 5 - 19, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Sodar: AeroVironment Model 2000

High Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-0.6
Maximum:	5.4
Minimum:	-3.0
Standard Deviation:	1.1
Root Mean Square (RMS):	1.2

	Wind Speed Difference (m/s, RWP - Sodar) Range Gate (m)						
	158	158	158	254	350	446	542
	-1	-0.8	1.8	0	-0.3		
	-0.4	-0.7	0.7	0.4			
	-1.4	1.1	1.9	-1.7			
	-0.4	2.3	0.2	-0.6			
	-0.2	1.9	0.8	-1.4			
	-0.3	1	-2	1.2			
	-0.5	-3	-0.3	-0.9			
	-0.5	-2.4	-1.1	-0.4			
	-1.1	-2.6	-1	-1.7			
	-0.2	-2.2	-0.4	-1.8			
	-0.6	-0.7	-0.3	0.3			
	-2.4	5.4	-1.2	0.2			
	-0.9	-0.7	-0.2	-0.3			
	-0.6	-1.2		-0.8			
	-1.2	-0.7		-1.3			
	-0.5	-0.8		-1			
	-1.2	1		0.4			
	-1.5	0.3		-0.4			
	-2.8	1		-1.1			
	-1.3	-0.3		-0.3			
	-0.6	-0.8		-0.5			
	-0.3	-0.6		0.9			
	-0.8	-0.5		0.1			
	-0.6	-0.7		0.1			
	-1	-1		0.5			
	0.6	-0.1		-1.2			
	-0.9	-0.1		-0.6			
	0.8	-0.5		-0.5			
	-1.8	-1.2		-0.3			
	-1	0					
	-1	-2.6					
	0.2	-1.9					
	-0.5	-1.5					
	-2.4	-0.9					
	-0.8	-1.5					
	-1.8	0					
	0.2	-0.8					
	-0.7	-0.8					
	0.7	0					
	0.8	-0.7					
	0.8	0.3					
	0.1	-0.8					
	-1.4	-1.1					
	-0.8	-2.2					
	-0.1	-2.4					
	-1.2	-2.3					
	-1.1	0.1					
	-0.9	-2.3					
	-0.7	-1.2					
	-0.8	-0.5					
	-0.2	-1.3					
	-1.7	0.5					
	-1.5	0.4					
Average:			-0.6	-0.4	-0.3		
Std Dev:			1.2	0.8	#DIV/0!		
RMS:			1.3	0.9	0.3		
Maximum:			5.4	1.2	-0.3		
Minimum:			-3.0	-1.8	-0.3		

Radar Profiler - Sodar Wind Speed Comparison

Site: Ontario International Airport
Date: November 5 - 19, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Direction (m/s)
Average:	-2
Maximum:	50
Minimum:	-62
Standard Deviation:	15
Root Mean Square (RMS):	15

	Wind Direction Difference (deg, RWP - Sodar) Range Gates (meters)						
	137	137	192	247	320	357	412
	8	1	9	-19			
	6	4	0	6			
	-4	-3	29	-6			
	12	-12	-13	-25			
	28	-6	-7	21			
	-2	-11	-2	25			
	0	6	10	1			
	-5	1	8	-19			
	-19	-17	-8	-4			
	12	-3	-4	-11			
	10	2	12				
	-3	-2	4				
	-6	-8	-10				
	-6	-13	-8				
	-6	3	-7				
	-5	-4	-8				
	-5	-11	2				
	-62	11	-29				
	-5	-1	-18				
	-10	6	-13				
	-5	3	7				
	21	1	-8				
	1	9	-11				
	-2	-2	-4				
	-4	8	-21				
	-10	-12	-14				
	-14	-9	2				
	-12	-2	-5				
	-2	-6	-11				
	-16	-1	42				
	-4	8	-13				
	-5	6	6				
	-10	21	23				
	1	14	-5				
	20	1	-12				
	-9	-8	-8				
	-30	2	-13				
	50	10	-19				
	8	-19	-59				
	-5	15	40				
	-2	-17	5				
	-11	-16	-9				
	0	1					
	-12	28					
	-10	-1					
	3	1					
	34	10					
	14	24					
	-37	0					
	28	-18					
	15	0					
	-19	-8					
	1	-21					
Average:		-1	-3	-3			
Std Dev:		14	17	17			
RMS:		14	17	16			
Maximum:		50	42	25			
Minimum:		-62	-59	-25			

Radar Profiler - Sodar Wind Speed Comparison

Site: Ontario International Airport
Date: November 5 - 19, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Sodar: AeroVironment Model 2000

Low Mode of Operation

Overall Difference Radar Profiler - Sodar	Wind Speed (m/s)
Average:	-0.4
Maximum:	2.8
Minimum:	-2.4
Standard Deviation:	0.8
Root Mean Square (RMS):	0.9

	Wind Speed Difference (m/s, RWP - sodar) Range Gates (meters)						
	137	137	192	247	320	357	412
	-0.9	0.5	-0.7	0.3			
	-0.2	-1.5	-0.9	-0.3			
	-0.7	1.2	-1	-1.2			
	0.1	0.2	-0.3	0.9			
	-1.1	0.6	0.3	-0.8			
	-0.9	-0.3	-0.6	-1.2			
	-0.1	-0.7	-0.6	0.4			
	0.4	0.5	-1.1	0.9			
	0.1	-0.2	1.4	-0.9			
	-0.4	-0.2	-2.4	-0.7			
	0.6	-0.8	-0.6				
	0.1	-0.5	-0.8				
	-0.5	-0.7	0.6				
	0.1	-0.4	0.6				
	-0.6	-0.5	-0.6				
	0.4	-0.6	-0.6				
	-0.2	-0.6	-1.5				
	-1.7	-1.7	0.9				
	-2.1	-0.8	1.2				
	-0.6	-1.2	-0.7				
	-0.2	-0.7	-1.8				
	-0.6	-0.5	0.8				
	0.1	0.1	0.5				
	-0.3	-0.3	0.4				
	-0.1	-0.7	-0.1				
	1.5	-0.4	-0.3				
	-0.2	-0.7	-0.7				
	-0.7	0.2	-0.2				
	-0.6	-0.8	-0.3				
	-1.1	-0.8	-0.5				
	-0.8	-1.5	0.2				
	-1	-1.6	-0.5				
	-1.4	-1.9	-1.5				
	-0.7	-0.8	-0.8				
	-0.5	-1.6	0.4				
	-1.2	-1.1	-0.3				
	1.4	-0.2	0.2				
	-1.9	-0.8	0.1				
	-0.7	1.2	0.8				
	-0.4	0.5	-0.9				
	-0.7	0.1	0				
	0.9	0.9	-1.7				
	0.8	1.1					
	0.7	2.8					
	-1.6	0.4					
	-1.3	0.3					
	-1.2	-2					
	-1.8	-1.3					
	0.1	-1.4					
	-0.3	-0.8					
	-0.1	0.1					
	-2.1	-0.9					
	-0.4	0.2					
Average:		-0.4	-0.3	-0.3			
Std Dev:		0.9	0.8	0.8			
RMS:		1.0	0.9	0.8			
Maximum:		2.8	1.4	0.9			
Minimum:		-2.1	-2.4	-1.2			

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Ontario
Date: July 29 - 30, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

High Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-1.7
Maximum:	4.2
Minimum:	-4.3
Standard Deviation:	1.6
Root Mean Square:	2.3

High Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	-1
Maximum:	112
Minimum:	-162
Standard Deviation:	39
Root Mean Square:	39

WS Difference (m/s)			
Altitude	7/29/97 2200	7/30/97 600	7/30/97 1000
144	-4.1		-0.6
241	-3.9		-0.3
338	-4.3		
435	-3.6		
532	-1.9		-0.5
629			-1.8
726	-2.1		-1.8
823	-2.9		-2.0
920	-3.4		-1.4
1017	-1.2		-0.4
1114		-0.5	-0.3
1211		-0.6	-0.7
1308		-0.7	-1.8
1405	4.2	0.4	-2.3
1502	-1.8	1.5	-2.0
1599	-1.4	0.7	-1.8
1696	0.2	-0.9	-4.2
1793	-0.7	-2.0	-4.1
1890	-2.5	-2.2	-2.1
1987	-3.9	-2.3	-0.9
2084	-3.8	-1.9	
2181	-2.7	-0.9	
2278	-3.4	-1.2	
2375	-3.3	-2.3	
2472		-2.5	
2569		-2.3	
2666		-0.4	
Average:	-2	-1	-2
Maximum:	4	1	0
Minimum:	-4	-3	-4
Std Dev:	2	1	1
RMS:	3	2	2

WD Difference (deg)			
Altitude	7/29/97 2200	7/30/97 600	7/30/97 1000
144	20		14
241	-11		-11
338	6		
435	6		
532	18		-162
629			-33
726	-120		-16
823	-2		5
920	-10		12
1017	54		1
1114		-9	-4
1211		0	0
1308		2	-5
1405	105	8	-5
1502	62	7	-5
1599	60	-3	4
1696	112	-7	-6
1793	14	-6	-8
1890	20	-2	-24
1987	-9	-2	-2
2084	-25	-3	
2181	-19	2	
2278	-29	2	
2375	-31	-2	
2472		-4	
2569		-7	
2666		-10	
Average:	11	-2	-14
Maximum:	112	8	14
Minimum:	-120	-10	-162
Std Dev:	52	5	39
RMS:	51	5	40

SCOS97-NARSTO Audit Report
Radar Profiler - Rawinsonde Wind Comparison

Site: Ontario
Date: July 29 - 30, 1997
Measurements Group: SCAQMD
Radar Profiler: Radian LAP-3000
Audit Rawinsonde: VIZ Model W-9000

Low Mode Overall Difference RWP - Rawinsonde	Wind Speed (m/s)
Average:	-0.2
Maximum:	15.1
Minimum:	-3.6
Standard Deviation:	4.1
Root Mean Square:	4.0

Low Mode Overall Difference RWP - Rawinsonde	Wind Direction (deg)
Average:	2
Maximum:	160
Minimum:	-144
Standard Deviation:	45
Root Mean Square:	45

WS Difference (m/s)			
Altitude	7/29/97 2200	7/30/97 600	7/30/97 1000
110			
165	-2.3		
220	-2.8		
275	-3.6		
330			-0.1
385			
440			
495	-1.6		
550	15.1		-0.3
605			-2.2
660			-1.6
715			-1.5
770			-1.7
825			-1.9
880	11.9		-1.6
935			-1.0
990	-2.0		-0.6
1045	-0.1		0.0
1100		-0.3	0.3
1155		-0.4	0.1
1210			-0.6
1265			-1.3
1320			-2.2
1375			-2.2
Average:	1.8	-0.4	-1.1
Maximum:	15.1	-0.3	0.3
Minimum:	-3.6	-0.4	-2.2
Std Dev:	7.3	0.1	0.9
RMS:	7.1	0.4	1.4

WD Difference (deg)			
Altitude	7/29/97 2200	7/30/97 600	7/30/97 1000
110			
165	3		
220	-2		
275	4		
330			-37
385			
440			
495	16		
550	-144		160
605			-30
660			-30
715			-12
770			-1
825			10
880	9		15
935			15
990	22		7
1045	45		8
1100		-12	4
1155		13	0
1210			3
1265			2
1320			-8
1375			-2
Average:	-6	1	6
Maximum:	45	13	160
Minimum:	-144	-12	-37
Std Dev:	58	18	43
RMS:	54	13	42

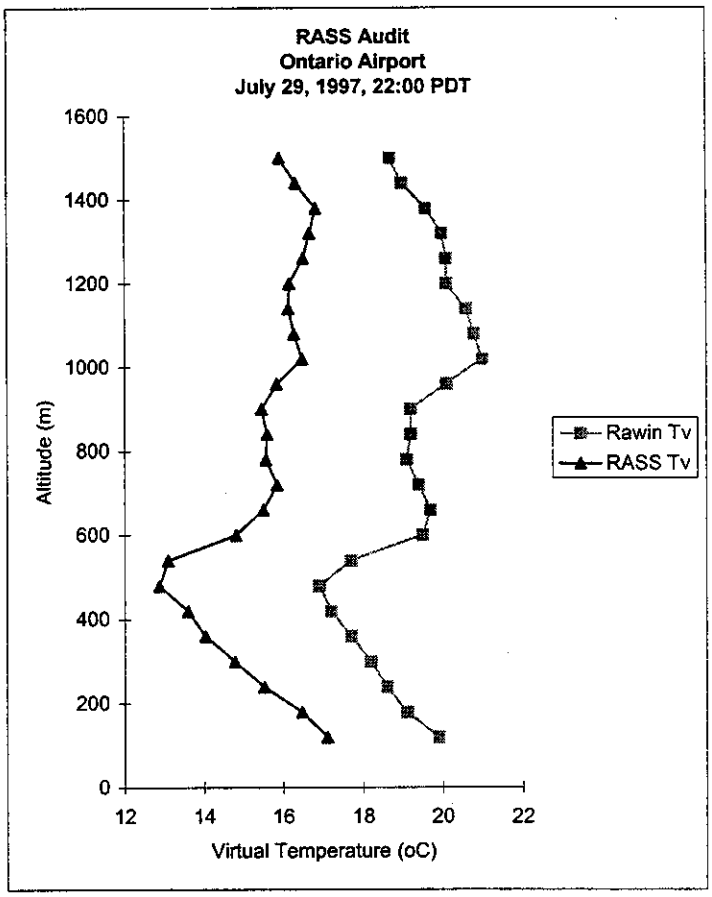
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 7/29/97
Start: 21:24 PDT
End: 21:36 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: ONT Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1500	15.9	18.7	-2.8
1440	16.3	19.0	-2.7
1380	16.8	19.6	-2.8
1320	16.7	20.0	-3.3
1260	16.5	20.1	-3.6
1200	16.2	20.1	-3.9
1140	16.1	20.6	-4.5
1080	16.3	20.8	-4.5
1020	16.5	21.0	-4.5
960	15.8	20.1	-4.3
900	15.5	19.2	-3.7
840	15.6	19.2	-3.6
780	15.6	19.1	-3.5
720	15.9	19.4	-3.6
660	15.5	19.7	-4.2
600	14.8	19.5	-4.7
540	13.1	17.7	-4.6
480	12.9	16.9	-4.0
420	13.6	17.2	-3.6
360	14.0	17.7	-3.7
300	14.8	18.2	-3.4
240	15.5	18.6	-3.1
180	16.5	19.1	-2.6
120	17.1	19.9	-2.8



Ave. Diff. : -3.7
Std. Dev. : 0.7
Min. Diff. : -4.7
Max Diff. : -2.6

Audit Criteria: +/- 1oC

Audit Sonde Data
Sonde Serial # : 2000750

Td offset (oC): 1.1
RH offset (%) 1

Sonde Pressure (mb): 982.9
Ref Pressure (mb): 983.5
Difference (mb): -0.6

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

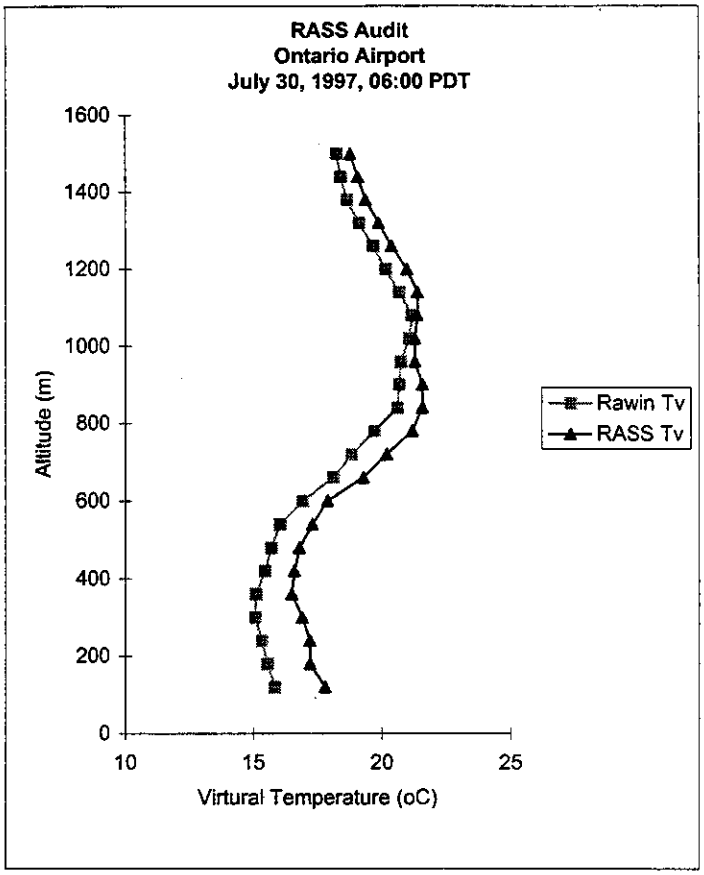
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 7/30/97
Start: 06:00 PDT
End: 06:15 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: ONT Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1500	18.8	18.3	0.5
1440	19.1	18.4	0.7
1380	19.4	18.7	0.7
1320	19.9	19.1	0.8
1260	20.4	19.7	0.7
1200	21	20.2	0.8
1140	21.4	20.7	0.7
1080	21.4	21.2	0.2
1020	21.3	21.1	0.2
960	21.3	20.8	0.5
900	21.6	20.7	0.9
840	21.6	20.6	1.0
780	21.2	19.7	1.5
720	20.2	18.8	1.4
660	19.3	18.1	1.2
600	17.9	16.9	1.0
540	17.3	16.0	1.3
480	16.8	15.7	1.1
420	16.6	15.5	1.2
360	16.5	15.1	1.4
300	16.9	15.1	1.8
240	17.2	15.3	1.9
180	17.2	15.6	1.6
120	17.8	15.8	2.0



Results Summary

Ave. Diff. :	0.8
Std. Dev. :	0.4
Min. Diff. :	0.2
Max Diff. :	1.5

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	2000700
Td offset (oC):	1.0
RH offset (%)	9
Sonde Pressure (mb):	984.3
Ref Pressure (mb):	984.1
Difference (mb):	0.2

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

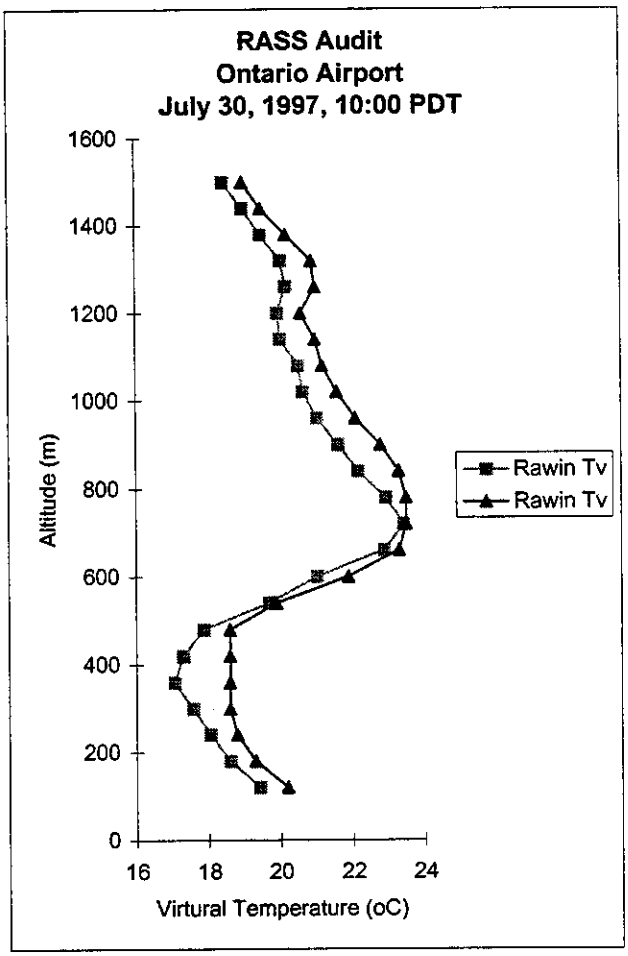
AeroVironment Environmental Services Inc.
Audit Report
RASS Summary

Date: 7/30/97
Start: 9:59 PDT
End: 10:12 PDT
Key Person: Kevin Durkee
Auditor: Alex Barnett

Site Name: ONT Airport
Project: Upper-Air Audits
Measurement Org.: SCAQMD

Instrument: Radian LAP-3000

RASS Alt (m)	RASS Tv (oC)	Airsonde Tv (oC)	Diff. (oC)
1500	19.0	18.5	0.5
1440	19.5	19.0	0.5
1380	20.2	19.5	0.7
1320	20.9	20.1	0.8
1260	21.0	20.2	0.8
1200	20.6	20.0	0.6
1140	21.0	20.0	1.0
1080	21.2	20.5	0.7
1020	21.6	20.7	0.9
960	22.1	21.0	1.1
900	22.8	21.6	1.2
840	23.3	22.2	1.1
780	23.5	22.9	0.6
720	23.5	23.4	0.1
660	23.3	22.9	0.4
600	21.9	21.0	0.9
540	19.9	19.7	0.2
480	18.6	17.9	0.7
420	18.6	17.3	1.3
360	18.6	17.1	1.5
300	18.6	17.6	1.0
240	18.8	18.1	0.8
180	19.3	18.6	0.7
120	20.2	19.4	0.8



Results Summary

Ave. Diff. :	0.8
Std. Dev. :	0.3
Min. Diff. :	0.1
Max Diff. :	1.5

Audit Criteria: +/- 1oC

Audit Sonde Data

Sonde Serial # :	2000834
Td offset (oC):	-0.6
RH offset (%)	-9
Sonde Pressure (mb):	984.1
Ref Pressure (mb):	984.8
Difference (mb):	-0.7

Comments: The sonde data was vertically averaged to match the RASS levels.
The sonde Td and Tw offsets were included in the Tv calculations.

PALMDALE (PDE)

SCOS97-NARSTO AUDIT SUMMARY
RADAR PROFILER/RASS/SODAR/SURFACE METEOROLOGY

Site: Palmdale (PDE)

Audit Dates: July 1, 1997

Instrumentation Audited: Radar Profiler, RASS, Surface Meteorology

Key Person(s): Clark King

Auditor: Robert A. Baxter

The purpose of this summary is to provide a preliminary report of any significant audit findings. The site is operated by NOAA/ETL. Key elements of the audit are identified below.

AUDIT INSTRUMENTATION

No problems were encountered with the audit instrumentation.

SITE CHARACTERISTICS

The site is in a flat and open area with good exposure. No changes in the site characteristics were noted since the candidate site review performed on April 18, 1997. The site review provided the vista information, therefore, this audit did not repeat those measurements. The results in the audit form reflect the previously noted characteristics with the exception of the vista in two of the directions. These vistas changed because of the placement of the antennas about 10 meters north of the original vista location.

SYSTEM AUDIT NOTES

The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

1. The 10 meter wind direction sensor orientation was outside of criteria which produced a total error of 6°. The sensor was aligned following the audit and the alignment verified.
2. There are no signs warning of potential audio or radio frequecy radiation. Appropriate signage is recommended.
3. The radar transmitter module was resting on the ground under one of the antennas. It is recommended it be mounted off the ground to prevent moisture entry or other problems with it on the ground.
4. The RASS source on the north side of the antennas had foam peeling from the side and partially covering the antenna dish. With the observed northeast winds during the audit this may be part of the reason limited coverage was seen on the RASS.

All of the RASS dishes, with the exception of one, were within ±1.0°. The dish on the east side was out of level by 1.2°. The dish was leveled following the audit.

5. The base of the meteorological tower is loose and can pivot. This will cause inaccuracies in the reported wind directions. The base should be secured.

The site is visited approximately once every four weeks. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

POTENTIAL ACTIVE NOISE SOURCES

Listen only tests showed no active sources.

POTENTIAL PASSIVE NOISE SOURCES

Some clutter was observed in the north antenna during aircraft activities along the runway to the north.

ANTENNA LEVEL AND ALIGNMENT

The north beam radar orientation differed from the audit measurement by 5°. The difference was verified and a change in the system setup made following the audit.

RADAR PROFILER PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RASS PERFORMANCE AUDIT

Not applicable (no performance audit performed).

RADAR PROFILER DATA INTERNAL CONSISTENCY

Data prior to the audit were reviewed from the ETL web site. Overall, the data look reasonable. Comparisons to surface winds collected during the same reviewed periods showed reasonable results in both speed and direction.

RASS DATA INTERNAL CONSISTENCY

During the period of the audit the vertical extent of the RASS data looked limited. Whether this was due to the current meteorological conditions or the partially covered RASS source dish on the north side is unknown. A review of RASS data collected over the last 4 to 5 days showed a capability to about 800 meters, on the average.

The overall data look reasonable. However, it is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project.

The current mode of operation is 106 m. This will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SURFACE METEOROLOGY PERFORMANCE AUDIT

All sensors are scanned every 10 seconds with five minute averages recorded. Other than the wind direction alignment error noted above, no problems were noted with the performance audit results. However, not all of the variables could be audited completely. A summary of these audits are provided below:

The temperature sensor could not be immersed in water and the probe design was not conducive to placement in a water proof sheath while retaining good thermal conductivity. Only one ambient comparison point was therefore audited.

Due to the wiring and the method of sensor installation, the wind direction sensor was not removed from the tower to perform the torque tests. The wind speed torque tests were performed by removing the nose cone and measuring the torque in the shelter. Future installations should consider an alternate installation that will allow for appropriate sensor evaluation.

Wind data recorded include scalar wind speed and resultant vector wind direction.

As indicated above, the 10 meter wind direction sensor orientation was outside of criteria which produced a total error of 6°. The sensor was aligned following the audit and the new alignment verified.

SCOS97-NARSTO

SITING AND SYSTEM AUDIT FORM

MEASUREMENTS GROUP:	NOAA/ETL
SITE NAME AND LOCATION:	Palmdale (PDE)
AUDITOR:	Robert A. Baxter
DATE:	July 1, 1997
KEY PERSON:	Clark King

I. Observables

A. Meteorological

Observable	Method	Manufacturer	Model	Serial #	Range
Wind Speed/ Wind Direction	Radar Profiler	NOAA/ETL	915 MHz	915-32-11	Lo 152 - 2296 m at 58 m inc. Hi 152 - 3905 m at 101 m inc.
Virtual Temperature	RASS	NOAA/ETL	915 MHz	915-32-11	157 - 1628 m at 106 m inc. (see below)
	Audio amplifier	Crest Audio	NA	NA	NA
10 m Wind Speed	Propeller	RM Young	Wind Monitor		0 - 50 m/s
10 m Wind Direction	Vane	RM Young	Wind Monitor		0 - 355 degrees
2 m ambient temperature	RTD	CSI	CS500	NA	-35 - 50 °C
2 m relative humidity	Solid State	CSI	CS500	NA	0 - 100%
Data Logging	Digital	CSI	21X	12112	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

Are there any required variables which are not measured? No

Are there any methods and/or equipment that are not in the SOP? Yes

Do any operating ranges differ from those specified in the SOP? See Below

Are there any significant differences between instrumentation on site and the SOP? No

Comments: Station has solar and net radiation in addition to pressure being monitored. As indicated above the RASS resolution should be increased to about 60 m.

B. Auxiliary Equipment

Type	Manufacturer	Model	Serial #	Last Calibration Date
Communications computer	NOAA	NA	NA	NA
Optical WORM drive	NA	NA	NA	NA

Comments:

B. Station Check Equipment

Type	Manufacturer	Model	Serial #	Comments
Extension Cord	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA

Comments: Station check equipment is carried with the NOAA engineers and not left on site.

II. Sensor/Probe height and Exposure

A. Radar Profiler/RASS/Sodar

Variable	Value	Meet SOP (Yes/No)
1. Orientation (three axis radar antenna)	Radar -- 5°, 1° 10 m Vane – 2.5°	No
2. Level (level and inclination of the horiz ant)	Radar -- <0.4° RASS – 1.2°	Yes No
3. Distance to closest obstruction	Not significant	Yes
4. Distance to closest active noise source	No significant active RF sources	Yes

Comments:
1. The orientation of one of the radar profiler antennas was off by 5°. There was a discrepancy between the readings of the auditor and site operator on the actual directions. This was resolved through a series of comparisons and identifying a potential nonlinearity and/or magnetic interference in the electronic compass used by the site operator. The audit values referenced the readings to solar observations. The 10 meter wind vane was also outside orientation criteria for the same reason.
2. One of the RASS dishes was out of level by 1.2°.
4. A listen only test of the radar revealed no significant RF sources nearby.

B. Surface Meteorology

Variable	Value	Meet SOP (Yes/No)
1. Height of wind sensors above ground	10 m	Yes
2. Distance to nearest obstacle	50 m	see below
3. Is separation at least 10x obst. height?	No	Yes
4. Are instruments on a rooftop?	No	NA
5. Is exposure 1.5x height above roof	NA	NA
6. Arc of unrestricted flow	355°	Yes
7. Height of temp sensor above ground	2 m	Yes
8. Distance of temp sensor from obst.	NA	Yes
9. Height of DP/RH sensor above ground	2 m	Yes
10. Distance of DP/RH sensor from obst.	NA	Yes
11. Are the distances 4x the obst. height?	Yes	Yes
12. Is the sensor shielded or aspirated?	Shielded	Yes
13. Are the T/DP/RH abv representative terrain?	Yes	Yes
14. Are there significant differences between on-site equipment and the monitoring plan?	No	Yes

Comments: 2, 3. A tree to the southwest provides a minimal blockage to the flow. The height of the tree is about 10 meters.

Wind data recorded include scalar wind speed and resultant vector wind direction. All surface sensors are scanned every 10 seconds with five minute averages recorded. The base of the meteorological tower is loose and can pivot. This will cause inaccuracies in the reported wind directions.

12. The temperature and relative humidity sensors are in a non-aspirated radiation shield. The data should therefore not be used in dispersion modeling.

III. Operation

A. Radar Profiler, RASS and Surface Meteorology

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is all instrumentation operational?	Yes (see below)	Yes
2. Are all cables secure?	Yes	Yes
3. Are all cables connected according to SOPs or instrument manuals?	Yes	Yes
4. Are connections clean and rust free?	Yes (see below)	Yes
5. Are serial numbers available?	See below	NA
6. Do data system times agree with audit times. If not, what is the deviation?	Yes	Yes
7. Is the printer functional?	No	Not used
8. Overall, is the site maintenance sufficient to meet the DQOs?	See below	Yes

Comments: 1. During the audit the optical drive used for the archiving of data failed. This should result in no loss of data since it is used as a backup device. The drive is expected to be repaired within two weeks.

The RASS source on the north side of the antennas had foam peeling from the side and partially covering the antenna dish. With the observed northeast winds during the audit this may be part of the reason limited coverage was seen on the RASS. The foam was repaired following the audit.

4. The radar transmitter module was resting on the ground under one of the antennas. It is recommended it be mounted off the ground to prevent moisture entry or other problems with it on the ground.

5. Did not want to move equipment to get serial numbers.

8. The site is visited approximately every four weeks for routine maintenance. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

B. Radar Profiler/RASS/Sodar Settings

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Software version	POP 4	Yes
2. High mode pulse length	700 ns	Yes
3. Low mode pulse length	400 ns	Yes
4. RASS pulse length	700 ns	Yes
5. Time zone	GMT	Yes
6. Wind data consensus	55 min (see below)	Yes
7. RASS consensus	5 min (see below)	Yes

Comments: 2, 3, 4. The data format from the web did not provide the pulse length data.

6, 7. The configuration indicated gave a 55 minute wind data consensus but because of the polling of the surface data during the first five minutes of the hour only gave about a 3.5 minute RASS consensus. Following the audit the RASS, the consensus was increased to 7 minutes to effectively provide a 5.5 minute consensus period (allowing the 1.5 minutes for the surface data polling). This also reduced the wind data consensus from 55 to 53 minutes.

	Wind Low Mode	Wind High Mode	RASS
First Gate	152 m	152 m	157 m
Last Gate	2296 m	3905 m	1628 m
Spacing	58 m	101 m	106 m
Full Scale Velocity	10.2	10.2	NA

Comments: It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project while retaining the altitude coverage.

B. Auxiliary Equipment

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is the A/C unit sufficient to maintain temperatures in the range specified in the SOPs?	Yes	Yes
2. Is the site temperature recorded?	No	See below
3. Is the site temperature maintained at 20-30°C?	Yes	See below
4. Is the site kept clean enough to allow operation of all instruments as specified in the SOP?	Yes	Yes
5. Does the modem work?	Yes	Yes
6. Does the telephone work?	Yes	Yes
7. Is the site secure?	Yes (see below)	Yes
8. Overall, is the auxiliary equipment maintenance sufficient to meet the DQOs?	Yes	Yes

Comments: 2. There is no measurement of the shelter temperature. It was indicated that the temperature is not critical for the system operation.

7. Security is good. There are no signs warning of potential audio or radio frequency radiation. Appropriate signage is recommended.

C. Station Check Procedures and Documentation

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Are the station logs present?	Yes	Yes
2. Are the station logs up to date?	Yes	Yes
3. Do station logs contain details as required by the SOPs?	Yes	Yes
4. Are routine checklists used?	Yes	Yes
5. Do the routine checklists contain details as required by the SOPs?	Yes	Yes
6. Are the calibration forms present?	No	See below
7. Do the calibration forms contain details as required by the SOPs?	NA	NA
8. Are the SOPs present?	Yes	Yes
9. Are the instrument manuals present?	No	See below
10. Do the SOPs include quality control tests?	Yes	Yes
11. If quality control tests are included then how are the results of the tests documented?	In site checklist	Yes
12. Has the site technician undergone training as specified in the SOPs?	See Below	Yes
13. Is the site visited twice weekly?	No	See below
14. Does the site technician understand the SOPs?	Yes	Yes (see below)

Comments: 6. Calibration records are maintained at NOAA/ETL

9. Manuals are maintained at NOAA/ETL. If repairs are needed then the engineer brings the manuals to the site.

12. There are no site technicians. During most times there is an engineer in the field that travels from site to site for the checks and needed maintenance.

13, 14. The site is visited approximately every four weeks for routine maintenance. In between the visits the data are polled and reviewed on a regular basis. Data are retrieved hourly and reviewed daily. There is a potential for problems to occur such as propeller failure or RASS source failure that would go unnoticed for up to four weeks. If a key Intensive Operational Period (IOP) is forecast, it is recommended the site be visited prior to the start of the IOP.

D. Chain of Custody

1. Review paper work for chain of custody from field to data processing.	Comments: The site is inspected every four weeks with all data archived at that time. Paperwork older than about two months is forwarded to NOAA/ETL.
2. How are data stored?	Data are stored locally on the computer hard drive with consensus files and surface data transferred on an hourly basis to the communications computer. The files on the communications computer are downloaded to NOAA/ETL on an hourly basis and then erased.
3. How often are the data backed up?	Files are copied to an optical drive on an hourly basis. These data are recovered on a monthly basis when the engineer visits the site.

Comments: 1. It is recommended a carbonless or similar form be used for the site checklist. In that manner a copy could be left at the site while the original can be sent back to NOAA/ETL.

V. Preventive Maintenance

Question	Response (Yes/No)	Meet SOP (Yes/No)
1. Is preventive maintenance discussed in the SOPs?	Yes	Yes
2. Is preventive maintenance being performed?	Yes	Yes
3. Are field operators given special training in preventive maintenance?	Yes	Yes
4. Are tools and spare parts adequate at the site to meet the requirements of the SOPs?	See below	Yes
5. Are maintenance logs maintained and reviewed?	Yes	Yes

Comments: 4. Tools and spares are carried with the field engineers. Some spares such as RASS transducers are stored at various sites throughout the NOAA/ETL network.

VI. Overall Comments

Question	Response (Yes/No)	Meet Work Plan (Yes/No)
1. Overall, is the station maintenance sufficient to meet the DQOs?	Yes	Yes
2. Does the siting meet the program objectives?	Yes	Yes
3. Overall, is the site technician trained as specified in the SOPs?	Yes	Yes
4. Does the QC program appear to be working?	Yes	Yes
5. Overall, does the meteorological data look reasonable?	Yes	See below
6. Overall, does the data appear to meet the program objectives?	Yes	Yes

Comments: 5. During the period of the audit the vertical extent of the RASS data looked limited. Whether this was due to the current meteorological conditions or the partially covered RASS source dish on the north side is unknown. A review of RASS data collected over the last 4 to 5 days showed a capability to about 800 meters, on the average. It is recommended the RASS be operated at a finer resolution (about 60 m), such as other systems in the project. The current mode of operation is 106 m. The finer resolution will remove some of the spatial averaging and provide a much clearer picture of the atmosphere. When changing the resolution, the height range should be maintained by increasing the number of range gates collected.

SCOS97-NARSTO AUDIT RECORD
VISTA, ORIENTATION AND LEVEL

Site Name:	Palmdale	Instrument:	NOAA ETL RWP
Date:	July 1, 1997	Receiver s/n:	915-32-11
Time:	1200 PDT	Interface s/n:	915-32-11
Measurements group:	NOAA/ETL	Firmware version:	POP 4
Key contact:	Clark King	System antenna angles:	004°, 090°
Audited by:	Bob Baxter	Measured orientation:	359°, 089°
Site longitude:	118° 05.41' W	Orientation difference:	005°, -001°
Site latitude:	34° 36.76' N	Antenna inclination diff.:	< 0.2° from 15° on both horizontal, < 0.4° on vertical
Site elevation:	NA	Horizontal beam angle:	15°
Magnetic declination:	15° (appx)	Beam directions:	004°, 090° ind.

Mag. Az. Angle (deg)	True Az. Angle (deg)	Terrain El. Angle (deg)	Features and Distances
NA	0	<2	Open to runway and hangars at ~ 1 - 1.5 km.
NA	30	<2	Open to runway and hangars at ~ 1 - 1.5 km.
NA	60	<2	Open to runway and hangars at ~ 1 - 1.5 km.
NA	90	2	Open to large hangar at ~ 1 km.
NA	120	<2	Open to trees at ~ 2 km.
NA	150	<2	Microwave relay towers at ~1 - 1.5 km.
NA	180	11	Terminal building at ~30 meters.
NA	210	14	Flag pole with flag waving at ~ 60 m.
NA	240	7	Fence with brush at ~10 m.
NA	270	8	Fence with brush at ~10 m.
NA	300	4	Trees at ~ 65 - 80 m. Hangars at ~800 - 1000 m.
NA	330	<2	Hangars at ~1 - 1.5 km.

Comments: The north beam orientation is off by 5°. The orientation setting in the radar was corrected following the audit. The antenna system is three-axis. The RASS system is operating with approximately a 3.5 minute consensus period. A 5 minute period is recommended. The RASS has 12 range gates with approximately 100 meter gate spacing. A range up to 1500 meters with a gate spacing of 60 meters is recommended. The RASS source dish on the east side was out of level by 1.2°. The level was corrected following the audit.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND SPEED

Date: July 1, 1997
Start: 0920 PDT
Finish: 0935 PDT
Auditor: Bob Baxter

Site name: Palmdale (PDE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Sensor s/n: unknown
K factor: 2.4
Range: 0 - 50 m/s
Logger: Campbell 21X
Logger s/n: 12112
Prop s/n: 42676

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: 0.2 gm-cm
Starting Threshold: 0.29 m/s

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WS Calibration Point	M/S Input	M/S Chart	M/S Diff. Chart	M/S DAS	M/S Diff. DAS	% Diff. DAS
1	0.0	#N/A	#N/A	0.0	0.0	#N/A
2	2.5	#N/A	#N/A	2.5	0.0	#N/A
3	7.4	#N/A	#N/A	7.4	0.0	0.0
4	12.3	#N/A	#N/A	12.3	0.0	0.0
5	22.1	#N/A	#N/A	22.1	0.0	0.0
6	34.3	#N/A	#N/A	34.3	0.0	0.0

Pass/Fail Criteria: +/-.25 m/s; ws <= 5 m/s
+/- 5%; ws > 5 m/s

Comments: Sensor passed.

SCOS97-NARSTO AUDIT RECORD
HORIZONTAL WIND DIRECTION

Date: July 1, 1997
Start: 0830 PDT
Finish: 1029 PDT
Auditor: Bob Baxter

Site name: Palmdale (PDE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: R.M. Young
Serial No.: NA
K Factor: NA
Range: 0 - 355 deg
Logger: Campbell 21X
Logger s/n: 12112

Model: Wind Monitor
Sensor Ht.: 10 m
Starting torque: NA gm-cm
Starting threshold: #DIV/0! M/S

Last calibration date: unknown

Crossarm: 180.5 deg true

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

WD Audit Point	Degrees Reference	Corrected Degrees Reference	Degrees Chart	Diff. Chart Deg.	Degrees DAS	Linearity	Total Diff DAS Deg.
Orientation	180.5				183.0		2.5
1	30	27.5	#N/A	#N/A	29.3	0.8	1.8
2	60	57.5	#N/A	#N/A	60.1	1.6	2.6
3	90	87.5	#N/A	#N/A	88.5	0.0	1.0
4	120	117.5	#N/A	#N/A	117.0	-1.5	-0.5
5	150	147.5	#N/A	#N/A	149.0	0.5	1.5
6	180	177.5	#N/A	#N/A	176.6	-1.9	-0.9
7	210	207.5	#N/A	#N/A	208.7	0.2	1.2
8	240	237.5	#N/A	#N/A	239.4	0.9	1.9
9	270	267.5	#N/A	#N/A	269.5	1.0	2.0
10	300	297.5	#N/A	#N/A	297.2	-1.3	-0.3
11	330	327.5	#N/A	#N/A	328.0	-0.5	0.5
				Avg difference:			1.0
				Maximum difference:		-1.9	2.6

Criteria: Orientation: +/- 2 degrees
Linearity: +/- 3 degrees
Maximum Difference: +/- 5 degrees

Comments: Sensor passed linearity test but failed orientation criteria.
The tower base is loose and can pivot in the wind causing inaccuracies in the wind direction data. The base should be secured.
The wind direction threshold could not be checked without removing the sensor from the tower. Due to the method of installation it was decided not to remove the sensor.
Note the "Corrected Degrees Reference" includes the offset for the arbitrary markings on the sensor shaft.
The sensor orientation was corrected following the audit.

SCOS97-NARSTO AUDIT RECORD
AMBIENT TEMPERATURE

Date: July 1, 1997
Start: 1007 PDT
Finish: 1007 PDT
Auditor: Bob Baxter

Site name: Palmdale (PDE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Cambell Scientific
Serial No.: NA
Range: -35 - 50 Deg C

Model: CS500
Sensor Ht.: 2 m

Logger: Campbell 21X
Logger s/n: 12112

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

Temperature Audit Point	Deg C Input	Deg C Chart	Deg C Diff. Chart	Deg C DAS	Deg C Diff. DAS
1	23.3	#N/A	#N/A	23.5	0.2
2	0.0	#N/A	#N/A	0.0	0.0
3	0.0	#N/A	#N/A	0.0	0.0

Criteria: +/- 0.5 degree Celsius

Comments: The sensor could not be immersed in water or used in a waterproof sheath.
A single point comparison was performed which showed acceptable results.

SCOS97-NARSTO AUDIT RECORD
RELATIVE HUMIDITY (DEW POINT TEMPERATURE)

Date: July 1, 1997
Start: 1007 PDT
Finish: 1007 PDT
Auditor: Bob Baxter

Site name: Palmdale (PDE)
Project: SCOS97-NARSTO
Operator: NOAA/ETL
Site Operator: Clark King

Sensor Mfg: Campbell Scientific
Serial No.: unknown
Range: 0 - 100 Percent

Model: CS500
Sensor Ht.: 2 m

Logger: Campbell 21X
Logger s/n: 12112

Last calibration date: unknown

Cal. Factors	Chart	DAS
Slope:	1.000	1.000
Int.:	0.000	0.000

RH/DP Audit Point	%RH Input	Deg C Input	% RH Chart	Deg C Chart	Deg C Diff. Chart	%RH DAS	Deg C DAS	Deg C Diff. DAS
1	20.4	0.6	#N/A	#N/A	#N/A	22.2	1.7	1.1

Criteria: +/- 1.5 degree Celsius

Comments: Sensor passed.